

DETERMINING THE RELATIONSHIP BETWEEN MOTIVATION AND ACADEMIC  
OUTCOMES AMONG STUDENTS IN THE HEALTH PROFESSIONS

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Admissions processes for health professions programs result in students entering these programs academically homogeneous. Yet some students have great difficulty with the programs. Research has shown a limited ability of traditional academic indicators to predict successful outcomes for health professions education. The purpose of this study was to examine the relationship between learning motivation and academic outcomes for students in health professions programs.

The Modified Archer Health Professions Motivation Scale (MAHPMS) and a demographic survey were administered at orientation to 131 medical and 29 physician assistant students at the University of North Texas Health Science Center in the fall of 2005. At the end of the semester, the same version of the MAHPMS was administered, and final course grades and semester averages were collected. Descriptive statistics were analyzed for all the study variables. Analysis of variance was utilized to examine within subjects and between subjects differences for the learning motivation scores among programs and demographic categories. Linear regression analyses were used to determine the relationship between learning motivation scores and end-of-semester grades. And finally, logistic regression was performed to explore the ability of the motivation scores to predict academically high-risk students.

Approximately three-fourths of the students indicated a preference for mastery learning and an internal locus of control. For the PA students, alienation to learning and performance goal scores statistically related to semester grades, and alienation to

learning scores predicted high-risk academic performance almost 90% of the time. For the medical students, mastery goal scores statistically related to semester grades, but no motivation score predicted high-risk performance. External locus of control scores predicted high-risk performance 81% of the time for the total group of students at the end of the semester.

Students in this study exhibited learning motivation preferences similar to those of other health professions students reported in the literature. The findings of this study agreed with the literature on achievement motivation theory and raised questions regarding the effect of health professions curricula on student learning goals. Similar studies, measuring larger samples longitudinally need to be conducted in order to further validate or elucidate the results of this study.

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## CHAPTER 1

### INTRODUCTION

Admission into graduate and professional education programs is a competitive process. There are more students desiring admission than available seats. In addition, the academic rigors of these programs require a high level of academic performance. Past academic performance is one way of predicting future academic success. Consequently, those students offered admission are usually the ones with the highest undergraduate grade point averages (GPAs), Medical College Admission Test (MCAT™, Association of American Medical Colleges, <http://www.aamc.org/copyright.htm>) and Graduate Record Examination (GRE® test, ETS, Inc., <http://www.ets.org/>) scores. Yet, with such a high-performing and academically homogenous student population, some students either, have great difficulty with the academic program, or do not successfully complete their medical or physician assistant (PA) school curricula. Few clues in the academic background are available to identify those high-risk students.

One of the purposes of the competitive nature of health professions admissions processes is to optimize the chances for success of the students selected. Students who struggle with the educational curriculum or who fail to complete the programs are costly to the institution and to the public. Although relatively few medical or PA students separate from their educational programs (< 10% in either program) (Office of Strategic Evaluation and Analysis, 2004), the total cost to the state of educating each student is high. It is estimated that the State of Texas invests approximately \$189,000 for each medical student and approximately \$59,000 for each PA student to complete their

respective programs (State of Texas, 2003). When students in these health professions struggle with the educational curricula, more time is needed to remedy deficits and usually time in the programs is extended. As a result, the financial investment increases.

The cost to the public for students in the health professions, who struggle with their curricula, is more than financial. Students who have difficulty critically analyzing and clinically applying medical information may cast doubts on the ultimate quality of the care that will be provided, if they graduate. It is both financially and ethically beneficial for health professions programs to identify at-risk students early, in order to optimize corrective intervention for the best outcomes.

Research has shown the limited ability of past academic performance (grade point averages and standardized exam scores) to predict successful outcomes in health professions education (Basco, Gilbert, Chessman, & Blue, 2000; Brown, Rosinski, & Altman, 1993; Collins, White, & Kennedy, 1995; Hobfoll & Benor, 1981; Kirchner, Stone, & Holm, 2000; Murden, Galloway, Reid, & Colwill, 1978; Reede, 1999; Rippey, Thai, & Bongard, 1981; Salvatori, 2001; Veloski, Callahan, Xu, Hojat, & Nash, 2000; Williams, 1997). Although pre-admission GPAs do positively correlate with pre-clinical didactic GPAs, there is no correlation between previous GPAs and subsequent clinical grades or postgraduate residency performance. In addition, even though all students enter into health professions programs with relatively high undergraduate GPAs due to the competitive admissions process, those GPAs do not predict who will fail courses or who will fail to complete a program and graduate. Because of this phenomenon, studies have been conducted indicating that non-cognitive characteristics play a significant role

in the development of desired graduate outcomes, particularly in the areas of clinical competence, critical thinking, and self-regulated learning. Non-cognitive factors have also been shown to correlate to academic performance while in the professional programs (Brown et al., 1993; Collins et al., 1995; Hendren, 1988; Murden et al., 1978; Ofori & Charlton, 2002; Reede, 1999; Salvatori, 2001). Non-cognitive variables are particularly important to the success of under-represented minority students (Edwards, Elam, & Wagoner, 2001; Feil, Kristian, & Mitchell, 1998; Reede, 1999).

Non-cognitive characteristics of individuals are difficult to isolate, due to the complex nature of personality and behavior, and a challenge to measure in the light of their intangible constructs. However, research is available to support the relationship of motivation to student learning in general, and specifically in health professions education. Motivation, as it relates to goal orientation, learning strategies, and locus of control, has been statistically shown to contribute to self-regulated learning and academic achievement in college students and adult learners in the health professions following admission to their programs (T. Garcia & Pintrich, 1992; T. Garcia, McCann, Turner, & Roska, 1998; Linder & Janus, 1997; Mattick, Dennis, & Bligh, 2004; Ofori & Charlton, 2002; Perrot, Deloney, Hastings, Savell, & Savidge, 2001; Simons, Dewitte, & Lens, 2004; Vanderstoep, Pintrich, & Fagerlin, 1996). These studies examined the relationships between goal orientation, use of learning strategies, and/or locus of control and academic achievement as measured by course exams at the end of one semester or at the end of one year of coursework in college or in medical, dental and nursing programs.

## Problem

Given the limited ability of past academic performance to predict successful outcomes and competence in the health professions, and given the current widespread use of academic achievement to determine the potential ability of individuals to achieve those expectations, the primary research question is: What is the relationship between motivation, as inferred from goal orientation, learning strategy, and locus of control, and learning outcomes in specific courses in health professions educational programs?

## Purpose

This research study studied the relationship between student motivation, as determined by goal orientation, learning strategy, and locus of control, and end of semester academic outcomes for first-year medical and physician assistant students enrolled at the University of North Texas Health Science Center.

## Research Questions

- 1) Is there a significant relationship between motivation, as measured by goal orientation, learning strategy, and locus of control, and the academic performance of medical and physician assistant students at UNTHSC?
- 2) Are there significant differences in goal orientation, learning strategy, and locus of control items *within* the medical and physician assistant student populations at UNTHSC?

- 3) Are there differences in the calculated motivation scales between demographic categories of the doctor of osteopathic medicine (DO) and PA students and between students in the two educational programs (DO or PA)?
- 4) To what extent do these three motivation scales, alone or in combination, predict low-risk or high-risk student performance, as measured in individual course grades and cumulative grade averages at the end of the first semester of enrollment in medical and/or PA school?

### Significance of Study

The potential significance of the study included adding depth to the field of health professions education by quantifying and evaluating non-cognitive, motivational qualities that may affect academic outcomes and expected competencies in these professional programs. In addition, the research assisted in lending evidence as to the hypothesized role of motivation in learning outcomes in health professions education as suggested in the literature. Practical significance revolved around the identification of motivational characteristics that relate to low-risk or high-risk performance from students which could be addressed by academic intervention efforts in health professions programs. And finally, this research assisted in the assessment of desired graduate outcomes by identifying current motivational characteristics in health professions students that have been either negatively or positively correlated to self-directed learning and critical thinking skills in the literature.

## Definition of Terms

In this study, “academic performance” was defined as end-of-semester grades for courses taken during the first semester of study in the medical and physician assistant schools. End-of-semester grades was calculated in percentages, based upon a 100-point scale for both student groups.

“High-risk student performance” was defined as end-of-semester course grades that fit into any of the following categories: 1) a failing grade (<70%) in any course; 2) a final course grade of < 76% in two or more courses for the semester; or 3) a cumulative semester average  $\leq$  79% (“C” average). “Low-risk student performance” was defined as end-of-semester course grades that do not fall into one of the three categories above (University of North Texas Health Science Center, 2004a; University of North Texas Health Science Center, 2004b; University of North Texas Health Science Center, 2004c).

In this research, “goal orientation” was defined as that individual characteristic that motivates a student to learn for different purposes. “Goal orientation” was divided into three categories: mastery, performance, and alienation goal orientations. “Mastery goal orientation” referred to students who learn to have a deeper understanding of the material. “Performance goal orientation” referred to students who learn to obtain higher recognition for their work. “Alienation goal orientation” referred to students who exert little effort to their learning because their motivation lies outside the learning environment (Ames, 1992; Archer, 1994; Blumenfeld, 1992; Perrot et al., 2001).

“Learning strategies” were defined as the individual mechanisms by which students approach learning and studying. “Learning strategies” were divided into three

categories: metacognitive, non-cognitive, and avoidance. “Metacognitive learning strategies” referred to students who understand their personal approach to learning and the requirements of the learning environment and can modify the learning approach to the situation. “Non-cognitive learning strategies” referred to students who do not have insight into their own learning approaches or cannot understand unique learning needs and, therefore, have a limited repertoire of strategies for learning. “Avoidance learning strategies” referred to the students who put very little effort into learning and often give up when learning gets harder to accomplish (Blakely & Spence, 1990; Dowson & McInerney, 1998; Perrot et al., 2001).

“Locus of control” was defined as the perception by students that relates to the ability to affect or control their own lives. “Internal locus of control” referred to individuals who perceive an internal mechanism to influence or change the things affecting their lives, while someone with an “external locus of control” perceive external circumstances as controlling their abilities to succeed. The operational definitions for locus of control were based on the use of Rotter’s I-E Scale for determining internal and external locus of control characteristics in individuals (Rotter, as cited by Perrot, Deloney, Hastings, Savell, and Savidge, 2001).

The “first-year medical student population” was defined as the total number of medical students who were enrolled in the University of North Texas Health Science Center’s medical school for the first time in fall 2005.

The “first-year physician assistant student population” was defined as the total number of physician assistant students who were enrolled in the University of North Texas Health Science Center’s PA program for the first time in the fall of 2005.

“Calculated motivation scales” were defined as the average score of the survey items that are statistically assigned to the each motivation subscale: mastery goal orientation, performance goal orientation, alienation goal orientation, metacognitive strategies, non-cognitive strategies, avoidance strategies, internal locus of control, or external locus of control.

“Demographic categories” were defined as those independent variables that functioned as group categories of covariates: gender, age, ethnic background, marital status, current educational program, previous undergraduate major, presence of children in the household, and whether or not this was the first attempt at gaining admissions.

### Limitations

Generalizations based upon the results of this study were limited, as the student sample represented only health professional students at one academic health center in the southwestern United States and may not represent the total population of all health professions students. Because the number of new physician assistant students who matriculate each year at UNTHSC fell below 30, there were limitations in drawing conclusions using the statistical analysis results on that group. The timeframe of the study also presented a limitation. Student performance problems might not be evident in the first semester of enrollment in a given program, but may occur later in academic programs that range from three to eight years (including residencies). And finally, some high-risk students were not identified by this study design. Students who separate from



the medical school or physician assistant programs before the end of the first semester were not able to complete the study as designed.

### Delimitations

Delimitations of this study included the following:

- Only first-year students enrolled for the first time in the osteopathic medical school and the physician assistant program at the University of North Texas Health Science Center were evaluated. Returning students, who repeated courses or repeated the year for remediation purposes, were excluded from the study.
- Only students in the two programs who were enrolled at the end of the first semester were evaluated in this study.
- Only first-year students in the two programs who voluntarily consented to participate in the study were evaluated.

### Assumptions

In this study, it was assumed that, due to the academic admissions criteria required for consideration by the two programs involved in the study, the students in the health professions programs at the University of North Texas Health Science Center were academically similar as they enter their respective programs. It was also assumed that the educational activities of the two professional programs involved in the study at UNTHSC were implemented in the usual fashion and not changed by the research. A

third assumption was that one semester of course work was sufficient time to determine the affect of motivation on academic performance in the students studied. And finally, it was assumed that the number of students that can be classified into high-risk or low-risk categories were in sufficient numbers and consistent with other high-risk and low-risk students in the two health professions curricula implemented prior to or after the study timeframe.

## CHAPTER 2

### LITERATURE REVIEW

#### Past Academic Performance and Future Success

Successful performance in health professions programs have been traditionally linked to high achievement indicators, such as grade point averages and scores on standardized achievement examinations. Competition for these highly sought after careers have mandated that admissions' criteria be objective and fair to all applicants. The scientific rigors required by the curricula have logically led educational administrators to conclude past academic performance will predict future professional success. However, research on predicting success in health professions education has indicated a limited ability of grade point averages and scores on pre-admission examinations to predict some desired outcomes and subsequently suggest the use of non-cognitive variables as equally important.

Research in health professions education does support a positive relationship between past academic performance (pre-admission grade point averages (GPAs) and standardized exam scores) and similar outcome measures in health professions programs, such as post-admission GPAs in pre-clinical courses and scores on national board exams (Salvatori, 2001; Sandow, Jones, Peek, Courts, and Watson, 2002; Dixon, 2004; Kirchner, Stone, and Holm, 2000; Basco et al., 2000; Collins et al., 1995; Hobfoll & Benor, 1981; Murden et al., 1978; Rippey, Thal, and Bongard, 1981). However, a study conducted at George Washington University School of Medicine and Health Sciences by Hendren (1988) looked at factors that might predict the success or failure of medical students by focusing on students identified to be at risk for dismissal.

Records were analyzed for 41 students who were identified as having academic difficulties and were reviewed by the Educational Evaluation Committee for academic recommendations to meet standards for progression through the program. The 41 students were classified into four categories of contributory factors leading to their academic difficulties in the program. The four categories were: 1) those with deficient academic capabilities to complete successfully; 2) those with intrapersonal problems related to personal conflicts or anxiety; 3) those with interpersonal problems who did not relate well with preceptors, colleagues and patients; and 4) those with both excessive anxiety and limited academic ability. I then examined the outcome variable of eventual graduation rates for these four categories of students. The highest graduation rates were found in two groups of students. The students who exhibited personal conflicts or anxiety and the students who had a mixture of anxiety and academic problems both had an eventual 71% graduation rate. Fifty-seven percent of the students who exhibited academic difficulties alone eventually graduated. The students who had the lowest graduation rate (8%) were the students who exhibited interpersonal relationship problems. This study suggested the critical role of non-cognitive factors in the identification of high-risk medical students, who initially manifested their limitations through academic difficulties.

One study was identified that investigated the correlation between cognitive and non-cognitive admissions variables and academic performance in one physician assistant program. Anna-leila Williams (1997) analyzed all the records of 256 students who entered the Yale University Physician Assistant Program between 1982 to 1992. Predictor variables included SAT® exam (College Board, <http://www.collegeboard.com/>)

scores, undergraduate GPAs, and high school rank, as well as demographic factors, such as gender, age and ethnic background. Outcome variables were course grades for pre-clinical course work, clinical rotation grades, attrition, deceleration, and graduation. As in the previous research cited, this study found that SAT math scores, high school rank, and undergraduate GPAs did weakly correlate with course grades in the pre-clinical phase of the programs ( $R= 0.27, -0.29, \text{ and } 0.22$ , respectively at  $p<.0001$ ). However, there were no statistically significant relationships found between undergraduate GPAs, SAT scores, or high school ranking and clinical rotation grades, deceleration, or attrition. The author concluded from the study that students with modest academic histories were just as likely to successfully complete the PA program as students with stronger pre-admission academic indicators.

The limited ability of past academic achievement to predict future medical competence has been made clearer in studies that focus on performance in postgraduate residency programs. A meta-analysis of the validity of using previous academic performance variables to predict achievement in medical school by Ferguson, James, and Madeley (2002) revealed interesting results. In this study past academic performance, as determined by grade point averages and standardized pre-admission exams, accounted for only 23% of the variance in undergraduate performance during medical school and 6% of the variance in the evaluations of postgraduate competence. In another study, Brown, Rosinski, and Altman (1993) reviewed the records of 20 students who graduated from the University of California, San Francisco, School of Medicine in 1983 and who had received poor evaluations from their residency directors. The authors compared these 20 students to 20 students from the same class who

obtained the best evaluations from their residency experiences. According to this study, the two groups of medical school graduates were very similar when comparing admissions qualifications, academic achievement during medical school, and scores on standardized national exams. The authors also reported only minor differences between the two groups in respect to performance evaluations during their undergraduate clinical rotations. After reviewing the residency directors' evaluations and comments for the medical graduates in the two groups, the most poorly received residents were individuals who exhibited personal or motivational problems rather than problems with knowledge base or clinical skills.

Discussion revolving around the heavy reliance of past academic performance to predict future success in the health professions cannot ignore the impact of this practice on underrepresented minority students. A study by Reede (1999) examined the relationship between traditional academic markers (undergraduate GPAs and Medical College Admission Test [MCAT™, Association of American Medical Colleges, <http://www.aamc.org/copyright.htm>] scores) and performance in medical school, residencies and subsequent practice. Reede concluded that even though underrepresented minority students exhibited relatively lower undergraduate GPAs and lower MCAT scores, their success in residencies and ultimately as practicing physicians was equal to that accomplished by non-minority students. Furthermore, in the Ferguson et al. (2002) study previously cited, the author concluded that traditional measures of past academic performance was inclined to over predict success for ethnic minorities and under predict success for their white counterparts.

## Competency-Based Outcomes

Over the past three decades, higher education in the health professions has increasingly focused on the need to develop methods of assessing graduate outcomes in terms of clinical competencies as measures of success. The traditional assumption that clinical competence is a natural result of the demonstration of content knowledge within a generally accepted educational structure has been questioned by all stakeholders. Due to the high cost of education and the expectations of patients, governments, and third-party payers, public accountability for providing society with cost-effective, compassionate health care of superior quality is at the ethical foundation of the current push to develop and appropriately assess competency-based outcomes resulting from health professions education (Abramson, 2004; Ludmerer, 1999). In response to the public and private demand for increased accountability from health professions educational programs, professional associations and educational accreditation organizations have begun the process of identifying the core competencies that should be expected of graduates. Across the health professions, competencies include variations of the following: an acceptable level of knowledge and skills; the ability to develop and maintain positive interpersonal relationships; accurate and reliable written and oral communication skills; and ethical and humane professional practice. Of the health professions reviewed, all considered the development of critical thinking and self-regulated, life-long learning as essential to proficient decision-making and continuous improvement in professional practice (AAPA House of Delegates, 2005; Accreditation Council for Graduate Medical Education, 1999; Accreditation Council for Pharmacy Education Board of Directors, January, 2005; APA Committee on

Accreditation, 2005; Board of Nurse Examiners for the State of Texas and the Texas Board of Vocational Nurse Examiners, 2002; Commission on Dental Accreditation, 1998). The process of assessing these competencies in health professions education has not yet been fully delineated in the literature on in higher education practice.

Traditionally, outcomes in health professions education have been assessed through academic achievement on content-based examinations and clinical skills proficiency evaluations. Research, however, has indicated that a greater cognitive knowledge base and adequate skills does not necessarily translate spontaneously into higher levels of clinical competence in practice settings. Content mastery and skilled performance do not automatically result in critical thinking or produce the motivation to be a dedicated, life-long learner. In his 1998 article, David Chambers discussed the theoretical basis for competency-based education. He pointed out that, in the literature, competency was defined as the progression from novice to expert in a given field. Competence was a step in the process rather than an end-point. In that journey, levels of competency involved a complex relationship between knowledge, skills and values (Chambers, 1998).

In a review of the literature by Carraccio, Wolfstahl, Englander, Ferentz, and Martin (2002), the authors examined the history of the emerging paradigm shift from content- and structure-based education to competency-based curricula in several medical disciplines. Although the need for such a change was recognized in the 1970s and 1980s, professional associations, program accreditation agencies, and licensing boards have just recently begun to define exactly what those competencies should encompass. According to the article, the challenge that faces health professions



education in the decade of the 2000s will be the development of a well-defined assessment system to measure the multidimensional components of professional competence.

Murray, Gruppen, Catton, Hays, and Woolliscroft (2000) attempted to address the concerns regarding the development and evaluation of the complex outcomes desired of graduate physicians. Their study utilized a series of literature searches to identify both the types of competency-based outcomes and the types and methods of assessing these outcomes reported in the literature. As a result, the authors constructed an extensive table matching the attributes desired, to the method of assessment, to comments about validity and reliability of the measurements as found in the literature. Murray et al. found a preponderance of assessment tools that focused on the domains of knowledge and skills and less than adequate systems to measure non-cognitive attributes. The authors suggested that medical education may have to incorporate more qualitative methods of measurement and assessment.

The concept of the difference between knowledge base and critical thinking domains was illustrated in a study by Friedman, Connell, Olthoff, Sinacore, and Bordage (1998) on medical students' clinical reasoning ability at the University of Illinois at Chicago. The authors conducted a randomized, controlled trial with 84 junior medical students as subjects. The treatment group received an educational intervention designed to improve their knowledge base associated with the specific diagnoses of diseases that were to be assessed in the study. The control group of students received no special educational intervention. The clinical reasoning of the students, in terms of diagnoses made with the evidence presented by standardized patients, was assessed.

In the end, both groups of students made comparable errors in diagnostic reasoning. In conclusion, the authors noted that improved knowledge base and physical examination skills did not transfer to better critical thinking. They also pointed out the need to consider the expansion of medical education to include teaching about thinking in addition to the traditional content-based instruction.

### Motivation and Learning

Learning is facilitated by the intention to learn, plus the development and implementation of a plan to accomplish the goal. This combination is often referred to in the literature as the “will” and “skill” of learning (Garcia & Pintrich, 1993). Motivation produces the incentive. Why invest the energy in the endeavor? According to Abraham Maslow (1970) motivation is rooted in meeting individual needs, but John Dewey (as cited in Campbell, 1995) saw education as both an individual and social process. As the learner matures, the process progresses from pedagogy (others-directed) in children to andragogy (self-regulated) in adult learners (Knowles, Holton, Elwood F., III, & Swanson, 2005).

There have been several psychological theories involving the motivation to learn, but many revolve around two basic constructs: the commitment to a goal (intention) and the willingness to invest effort toward its accomplishment (volition) (Archer, 1994; Garcia et al., 1998; Perrot et al., 2001). This review will focus on the theoretical constructs related to motivation leading to goal achievement.

## Goal Orientation

Achievement motivation theory relies on two psychological constructs that are derived from differing motivational drives, or goal orientations, and results in distinct patterns of learning behavior. Mastery goal orientation has, as its foundation, the basic attitude that learning is intrinsically valuable and will result in a deeper understanding and improved competence. This perspective views errors and difficulties as an opportunity to gain a better mastery of the material. Performance goal orientation, on the other hand, connects ability with self-worth, where success is measured by outperforming others. Recognition and praise for their accomplishments by others is important to performance-oriented learners (Ames, 1992; Archer, 1994; Blumenfeld, 1992; Perrot et al., 2001). Archer (1994) added a third goal orientation that had been reported in the literature, when she developed an instrument to measure the motivation of college students in Australia. This third goal was founded in the desire to use minimal effort in completing academic assignments, called academic alienation. Academic alienation revolves around avoiding work to achieve the goal. It is important to note that individuals are not exclusively motivated by only one type of goal orientation, but do tend to have a preference for one orientation or another. In addition, performance orientation has been occasionally reported in the literature as “failure avoidance” (Seifert & O’Keefe, 2001). This term is not to be confused with “work avoidance” used to describe academic alienation (Archer, 1994; Seifert & O’Keefe, 2001).

While several studies in the literature address the identification of goal orientations in learners, few studies have explored whether these goal orientations are stable in learners or change over time in response to educational environments. One

study was conducted by nursing faculty at the University of Arkansas for Medical Sciences to determine whether mastery goals could be improved in nursing students through educational intervention. Gardner (2006) conducted a quasi-experimental, randomized, matched-pairs study involving students from five associate degree (2-year) nursing programs in the state. The students were given a pretest and posttest, using the Comprehensive Goal Orientation Inventory. After the pretest the nursing students were matched based upon pre-intervention mastery scores, grade point averages (GPAs), age, previous work experience, and prior education. They were then randomly selected to be in either the experimental or the control groups for the study. A three-week educational intervention on differences between mastery goals and performance goals was given to the experimental group. In this study, the posttest revealed statistically significant differences between the mastery scores of the experimental and control groups of students. The study also reported that the experimental group increased their mastery goal scores to statistical significance and decreased their performance goal scores to some degree. The results of this study indicated that desired goal orientations, fostering learner persistence in solving clinical problems could be learned and implemented, even after a short intervention.

### Locus of Control and Goal Orientation

Locus of control refers to a person's perception of his/her own ability to affect or alter one's life. Individuals with an internal locus of control believe that their own decisions and behaviors primarily determine their lives' paths, while a person with an external locus of control sees life as a product of circumstances, often beyond individual

control, or perhaps a result of luck or fate. According to Rotter's research (as cited by Perrot, Deloney, Hastings, Savell, and Savidge, 2001), a personal awareness of an internal locus of control has a positive effect on motivation and academic achievement in the educational setting. Students with an internal locus of control see themselves as being in charge of their own learning; i.e., self-regulated, while students with an external locus of control tend to put the responsibility of their learning on others.

A study by Siefert and O'Keefe (2001) pointed out that high school students, who were found to have a learning (mastery) goal orientation also exhibited an internal locus of control. The authors' research on 512 senior high school students in Canada also showed an association between an external locus of control and work avoidance or academic alienation. This particular study only measured the two goals, mastery learning and work avoidance goals, and related these two goals to externality (locus of control). Results of the study indicated that externality was negatively correlated to learning (mastery) goals and positively related to work avoidance.

The relationship between performance goal orientation and locus of control is a little more confusing. Even though performance-oriented learners look for recognition for their successes from external sources, they often see their own ability as the cause of success or failure. Therefore, they tend to be internally controlled, but externally motivated in the learning situation. Their impetus comes from an internal desire to do better; however, they tend to "work harder," rather than "work smarter" in their educational endeavors. Some authors consider performance orientation and academic alienation closely related. According to this line of thought, both of these goal orientations are founded in egocentricity and the perception of others. The difference

lies in the subsequent responses to that orientation. Students with performance orientations tend to work harder to avoid failure, while students with an academic alienation orientation avoid work to avoid failure (Simons et al., 2004).

### Learning Strategies and Goal Orientation

Given the motivation to learn, related to goal orientation and perceived locus of control, students engage in various strategies to accomplish the learning goal. The most effective strategy for optimal learning is thought to be metacognition by experts in the field. A student who utilizes metacognition thinks about “thinking,” understands his/her own learning, and has the ability to develop and implement strategies to fit the learning environment. Learning strategies based on metacognition include reflection, planning, monitoring, and evaluating, in order to select learning strategies deliberately for specific purposes. It requires connecting new information to old and an ability to use a variety of approaches to learning (Blakely & Spence, 1990; Dowson & McInerney, 1998; Perrot et al., 2001). Metacognition is believed to be integral to self-regulated learning and tied to successful academic performance (Dowson & McInerney, 1998; Lindner & Harris, 1993).

Researchers have studied the basic assumption that a positive relationship exists between a mastery goal orientation, an internal locus of control, use of metacognitive strategies, and the development of self-regulated learners. Jennifer Archer (1994) developed a self-reported survey designed to measure eight scales related to student perceptions, motivations, and strategy use in first-year college students. The eight scales included: (1) mastery, performance, and alienation goal orientation; (2) use of

metacognitive, non-cognitive, and avoidance learning strategies; (3) preference for easy or difficult tasks; (4) perceived internal or external locus of control; (5) self-perceived ability; (6) enjoyment; (7) relevance; and (8) willingness to take more courses (intention to persist). The focus of the Archer study was to validate the instrument, but some interesting statistical relationships emerged. The results indicated that college students' orientation toward mastery or academic alienation related positively with their preferences for difficult or easy tasks, respectively. Students with the mastery orientation preference also preferred the use of metacognitive learning strategies. Interesting, in the Archer study, there were no statistically significant correlations between goal orientation and a specific locus of control measures.

Perrot, Deloney, Hastings, Savell, and Savidge (2001) confirmed similar findings in first-year nursing, medical and pharmacy students at the University of Arkansas for Medical Sciences. Perrot et al. modified the Archer (1994) instrument with permission from the author to include the primary learning constructs most appropriate for health professions students. The Modified Archer Health Professions Motivation Scale (MAHPMS) included four of the eight original scales: (1) the goal orientation scale; (2) learning strategies; (3) preference for easy or hard tasks; and (4) locus of control scales. The instrument was administered to 252 first-year students in the three professional programs during the 1998-1999 school year. Again the purpose of the study was to validate the modified instrument for these theoretical constructs in this student population. The factor analysis of the modified instrument agreed with Archer's analysis. Reliability coefficients, Cronbach's alpha, were 0.8706, 0.7297, and 0.6174, respectively, for the goal orientation scale, locus of control scale, and learning strategies

scale. No numbers were available for the preference for difficult or easy tasks, which consisted of only two items. Descriptive statistics revealed the majority of students in the three programs held a mastery orientation to their learning (67% in medicine, 68% in nursing, and 50% in pharmacy). Pharmacy had the highest percentage of students with a performance orientation (42%). The majority of students reported the use of metacognitive learning strategies (nursing, 73%; medicine, 59%, and pharmacy, 54%). And finally, a perceived internal locus of control was reported in 87% of the nursing students, 85% of the pharmacy student, and 76% of the medical students. The findings of this study supported that of Archer (1994) in that students with mastery orientation to learning were more likely to prefer metacognitive learning strategies. Most students, regardless of goal orientation, reported an internal locus of control. The combination of mastery goal orientation, internal locus of control, and effective use of metacognitive learning strategies would logically be preferred in health professions students; however, this study did not examine the academic outcomes of the students involved to know if that combination positively correlated with improved academic performance in their programs.

One study was found that compared dental and medical students' approaches to learning at admission and at graduation to determine whether their learning strategies changed over the course of their studies. Lindemann, Duek, and Wilderson (2001) administered the Approaches to Learning Inventory (ASI) to 91 dental and 115 medical students entering the class of 1998 at the University of California at Los Angeles. The instrument was then administered again to a random sample of the same students at the end of the fourth year. The ASI measured learning strategies in terms of "deep,"



“surface,” and “strategic” approaches to learning. “Deep” processing involved understanding the underlying meaning and structure of material. The “surface” approach learned material in order to duplicate it and utilized memorization as a tool. “Strategic” learners used any method of learning that will produce the best grade, given the nature of the assignment. Interestingly, results from this study revealed that students who entered with a deep approach to learning did not change significantly over time; however, students who entered with a strategic approach, used more memorization (surface) strategies when measured at the end of four years. Dental students entered with more surface strategies than medical students, and both groups appeared to regress to the mean; i.e., the dental students used surface learning less and medical students used surface learning more at the end of the study. This study suggests that the nature of some health professions curricula may require the use of learning strategies that do not foster the deep understanding of material expected for practice.

### Motivation, Strategies and Academic Outcomes

A few studies have explored the relationship between motivation or the use of learning strategies and academic outcomes in both college students and students in health professions education. Garcia and Pintrich (1992) conducted a study on 758 college students attending three midwestern institutions of higher education during the 1987-1988 academic year. The goal of their study was to identify some of the motivational attributes and learning strategies related to critical thinking. “Critical thinking” was defined by the authors as the degree to which students applied previously

acquired knowledge to new situations for the complex purposes of critical analysis, decision-making, and problem-solving. Utilizing the Motivated Strategies for Learning Questionnaire (MSLQ), the researchers measured the following characteristics in students studying biology, English, and social sciences:

- 1) Intrinsic goal orientation (level of student engagement for purposes of deeper understanding, fulfilling a personal curiosity, or challenge)
- 2) Rote rehearsal learning strategies (level of use of memorization and repetition to learn)
- 3) Elaboration learning strategies (use of paraphrase, analogies, or summaries to learn)
- 4) Metacognitive self-regulatory strategies (use of the process of planning, regulating and monitoring in learning)
- 5) Critical thinking (see above)

Multivariate regression analyses were performed to determine the correlation between the first four variables and critical thinking in the three groups of students at the beginning and again at the end of the winter semester that year. Results of this study indicated that internal motivation and elaboration strategies were statistically significantly positive predictors of critical thinking in biology and social science students, however not with English students. On the other hand, metacognitive self-regulatory strategies were consistently positive predictors for critical thinking across all three disciplines. As might be expected, rote rehearsal strategies were not related to the process of critical thinking in these college students. Even though the motivation scales

on this particular instrument were termed a little differently, the theoretical constructs measured were quite similar to other works cited in this literature review.

Another study out of the United Kingdom explored the correlation between the use of learning strategies and academic performance in first-year medical students. Mattick, Dennis, and Bligh (2004) found that medical students, in general, exhibited a mastery orientation and deep approach to learning commonly. In addition, this deep approach appeared to be associated with higher scores on three (3) applied knowledge exams given throughout the academic year. The differences in the grades were statistically significant for exams 2 and 3, with increasing strength of relationship over time.

Sorbal (2004) measured motivation and learning strategies in medical students and looked at the relationship between those factors and academic performance, measured through examinations in didactic courses and performance in clinical rotations. Again, the instrument utilized to measure these non-cognitive factors was different (The Academic Motivation Scale), but the motivational constructs tested were similar to those for goal orientations, learning strategies and locus of control previously discussed. The results of this study supported the findings of the Perrot, Deloney, Hastings, Savell, and Savidge (2001) study with respect to the preponderance of students exhibiting a “mastery” goal orientation to learning. In addition, a mastery orientation was positively associated with the effective use of metacognitive strategies and self-regulated learning by the students in the Sorbal study. However, in this study, both mastery and performance orientation appeared to contribute positively to academic success. This conclusion is logical, given the focus of current medical education and the

measurements of performance assessment used in this study (knowledge base and clinical application).

Two studies found in this literature review researched the relationship between locus of control and academic achievement in dental students and nursing students. Linder and Janus (1997) found a positive relationship between internal locus of control scores and one preclinical course grade at the end of the fall, 1996, semester for the dental students studied. Limited conclusions may be drawn from this study due to the limited nature of the one outcome variable. Ofori and Charlton (2002) looked at multiple variables and their role in the academic performance in one course module for 344 nursing students in England. From the study, the authors concluded that students who sought academic support (a component of self-regulated learning) exhibited higher academic outcomes in the module, and suggested that a stronger internal locus of control indirectly influenced greater support-seeking.

### Dilemmas and Directions

It is a shared expectation and desire by individuals and society to insure competent practitioners in the health professions through the use of effective analytical reasoning and the development of self-regulated, life-long learning. Emerging research has provided evidence that the traditional focus on teaching the breadth of knowledge opposed to the depth of understanding its application, has often failed to produce those outcomes. Increasing focus has centered on the role of measurable non-cognitive constructs in the development of effective self-regulated learners, who have the motivation, insight, dedication, strategies, and perseverance to achieve the desired level

of competence required of their chosen professions. This research study is designed to initiate a scholarly examination of the relationship between motivation, as inferred by goal orientation, use of learning strategies and locus of control, and academic outcomes in medical and physician assistant students at the University of North Texas Health Science Center at Fort Worth, in an attempt to gain better understanding of the role of non-cognitive variables in health professions education.

# CHAPTER 3

## METHODOLOGY

### Research Design

The research design was a non-experimental causal relationship study (Gall, Gall, & Borg, 2003) to explore the correlation between motivation and academic achievement in medical students and PA students who entered their respective programs at the University of North Texas Health Science Center in fall 2005.

### Procedure for Data Collection

The procedure for data collection was approved by the University of North Texas' Institutional Review Board (IRB) and the University of North Texas Health Science Center's IRB. On the first day of orientation, July 25, 2005, medical and physician assistant students, entering their respective educational programs in the August 2005, were addressed to request participation in this research project. The Modified Archer Health Professions Motivation Scale (MAHPMS), a demographic survey, and the IRB-approved informed consent form were distributed to 142 medical students and 30 physician assistant students. The study was explained, and the students were given an opportunity to read the informed consent form and ask questions regarding the research. Only students who were entering their health professions programs for the first time and had not attended any professional course work at the University of North Texas Health Science Center previously were asked to participate in the study. Those who voluntarily consented to participate were asked to sign the consent form and complete the MAHPMS and demographic survey, and return all documents when

completed. In this way, the MAHPMS was administered prior to the dissemination of any information or advice given the students at orientation regarding the nature or recommended approach to the professional curricula. The demographic survey was an 8-item, self-reported survey, constructed for the present study which included the following data that were considered potential covariates:

- Educational program at the UNTHSC
- Gender
- Age
- Ethnicity
- Marital status
- Presence or absence of children
- Was this is the first attempt at admission to program
- Undergraduate major

Paper copies of both surveys were administered and electronically scored by the Academic Information Services of the University of North Texas Health Science Center. It was estimated that it took students approximately 20 minutes to complete the two surveys.

Unique identifying numbers, the last four digits of the students' social security number, were assigned to the MAHPMS and the demographic survey for the purposes of coding data throughout the study. A master list of the students' unique identifying numbers and their informed consents were kept in a locked room, Room ENX1-110AB, in the PA program offices, which has been established as a central repository for all research data, generated by the department.

At the end of the first semester of courses in the Texas College of Osteopathic Medicine and the Master of Physician Assistant programs, the same version of the

MAHPMS was administered via computer to medical and PA students enrolled in their respective programs at the end of their first semester of study. This student sample was derived from the same two student groups measured at the beginning of the semester. The student sample was contacted via official school email on December 6, 2005, requesting completion of the second administration of the MAHPMS at the end of the first semester of study. The email contained a URL link to the survey instrument, developed with the assistance of the UNTHSC Office of Academic Information Services (AIS). AIS encrypted the survey data, so that personal email identifiers were not maintained. With the assistance of AIS, reminders to complete the second MAHPMS were emailed to the students on December 15, 2005, and again in January, 2006, after the students returned to campus following the semester break.

Final course grades and final semester averages, based upon a 100% scale, were also collected from the academic directors of each respective professional program. Any fall semester course that is assigned a “pass/fail” grade was excluded in the semester grade average calculations for both programs. Originally it was planned to collect information regarding any participation in academic interventions offered by the Office of Academic Support during the fall semester as a potential covariate of the study variables. However, that particular covariable could not be accurately collected from the director of that office since there were several large group tutorials offered in addition to individual tutoring, where many students attended the sessions on a voluntary basis and attendance was not recorded or tracked.



## Instrument

The instrument utilized in this study was the Modified Archer's Health Professions Motivation Survey (MAHPMS) (Perrot et al., 2001). The author of this study obtained permission from Perrot, the primary author, to use the instrument she and her colleagues designed and described in the literature (2001). The MAHPMS is an instrument that was modified from an original instrument, designed and described by Jennifer Archer (1994). Four of Archer's original eight (8) scales were used in the Perrot et al. (2001) instrument to better fit the constructs determined as relevant in measuring the student populations in health professions programs. The scales included in the MAHPMS are: goal orientation (41 items); learning strategies (15 items); preference for easy or hard tasks (2 items); and causal attributions for success or failure (internal or external locus of control-10 items). Validity and reliability statistics were analyzed on the modified (MAHPMS) instrument. A varimax factor analysis was used in the Perrot et al. study to reduce the goal orientation scale and agreed with Archer's factor analysis in the original instrument. Cronbach's alpha for the goal orientation scale in the Perrot et al. study was  $\alpha = 0.8706$ . Reliability for the learning strategies scale was  $\alpha = 0.6174$ , and reliability for the causal attributions was  $\alpha = 0.7297$  (Perrot et al., 2001).

## Population, Sample, Subjects

The sample for this research was derived from the total population of all DO and P.A. students enrolling into their respective programs for the first time in fall 2005 at the University of North Texas Health Science Center at Fort Worth. One hundred forty-two osteopathic medical students and 30 physician assistant students were present on the

first day of orientation on July 25, 2005. Even though the number of new PA students who matriculated at UNTHSC in the fall of 2005 was small, the number represented all the students who enrolled in the PA program that year. Students who had enrolled in and had attended any of their respective professional programs prior to July 2005 were excluded from the study. By the end of the fall 2005 semester, three medical students had withdrawn from school and were not available to participate in the end-of-semester MAHPMS survey. No PA students withdrew before the end of the fall semester.

### Data Analysis

All statistical analyses for this study were performed using SPSS 12.0 for Windows statistical software package. Factor analysis was performed on the items of the Modified Archers Health Professions Motivation Scale used in this study to confirm the validity estimates for the principal components or factors represented by the survey items and the independence of the factors measured by this instrument attributed to motivational constructs. I also calculated Cronbach's coefficient alpha on the same instrument to estimate the reliability of the instrument with this study sample. The results of the factor analysis and the Cronbach's coefficient alpha were compared with the results of the validity and reliability studies performed by Perrot et al. (2001) on the original study that tested the instrument at the University of Arkansas for Medical Sciences. In addition, I used the factor analysis for this study and data from the Perrot et al. study to assist in assigning survey items to a specific motivation subscale for data analysis. Responses to each survey item were measured numerically using 5-point Likert scale with 1 representing the least positive response and 5 representing the most

positive response. Responses to items assigned to each motivation subscale were averaged to obtain a motivation subscale score for statistical analysis.

Descriptive statistical analysis of the demographic variables for the study sample was performed using frequency distributions. Frequencies, means and standard deviations of all motivation subscale variables measured for the combined and individual student groups that comprised the study sample were also computed.

The following statistical analyses were completed to answer each of the four research questions:

For Research Question 1: Is there a significant relationship between motivation, as measured by goal orientation, learning strategy, and locus of control, and the academic performance of medical and physician assistant students at UNTHSC?

Simultaneous and stepwise linear regression analyses were performed to analyze the relationship between the MAHPMS subscales and end-of-semester cumulative grade averages. This analysis was performed on both administrations of the instrument, examining the results of the total sample (medical and PA students combined), as well as the results of the separate student groups. Multiple linear regression statistics were used to explore the relationships between the MAHPMS subscales and individual semester course grades. Courses designed to develop and measure psychomotor skills primarily based upon the mastery model, such as physical exam or osteopathic manipulation skills were included in the semester averages, but were also analyzed individually to determine if these courses demonstrated enough variance in their final scores to contribute to the analyses. Linear regression analyses using individual course grades were performed on both administrations of the

instrument for each individual student group (medical and PA students separated), since the two groups of students did not take the same courses.

For Research Question 2: Are there significant differences in goal orientation, learning strategy, and locus of control items within the medical and physician assistant student populations at UNTHSC?

Repeated measures within-subjects analysis of variance (ANOVA) statistical procedures were utilized to determine if differences existed between the mean MAHPMS subscale scores for the two administrations of the survey instrument within the sample populations.

For Research Question 3: Are there differences in the motivation scales between demographic categories of students and between students in the two educational programs?

One way analysis of variance (ANOVA) was utilized to explore statistical differences in the motivation subscale scores between demographic categories and between educational programs. Two demographic variables, age and undergraduate major were coded into categories for purposes of analysis of variance between categories. Age was divided into: 1) age less than 25 years old and 2) age 25 years old or greater in order to look at differences between younger and older students and to create balanced cell sizes for statistical analysis. Undergraduate majors were categorized into 8 areas: 1) biological or life sciences, which included biology, zoology, physiology, etc.; 2) biochemistry and chemistry; 3) mathematics, engineering, and computer science; 4) social sciences, such as psychology and anthropology; 5) language, humanities, arts, and religion; 6) health professions; 7) business; and 8) other.

For Research Question 4: To what extent do the motivation scales, alone or in combination, predict successful (low-risk) or at-risk (high-risk) student performance, as measured in first semester course grades and first semester cumulative averages in medical and/or PA student outcomes?

Forward selection logistic regression was performed to analyze the ability of the MAHPMS subscale scores, alone or in combination, to predict end-of-semester high-risk and low-risk academic categories as defined *a priori*. The analysis was performed on the total group of subjects and also on the subjects divided into their respective educational programs.

## CHAPTER 4

### RESULTS

#### Study Sample

A total of 160 (131 doctor of osteopathy (DO) and 29 physician assistant (PA)) students met the inclusion criteria and returned the Modified Archers Health Professions Motivation Scale (MAHPMS) and demographic surveys to me at orientation on July 25, 2005. Of the 160 returned surveys, 153 (126 DO and 27 PA) could be utilized for analyses. These numbers represented 89% and 90% of the targeted student sample, respectively. Seven sets of data were deselected. Five datasets were deselected because there were no signed informed consents accompanying the surveys. Two datasets were deselected due to a large number of survey items left unanswered, whereby the learning motivation subscale scores could not be adequately analyzed.

Sixty-three students (42 medical students and 21 PA students) from the sample that completed the first survey completed the second administration of the survey in December 2005 and January 2006. This return rate represented 41% of the original combined study sample. This number also represented 33.3% of the original medical school sample and 78% of the physician assistant student sample. Three medical students from the original study sample did not complete all their courses for the semester and were not available to participate in the end-of-semester MAHPMS survey. No first-year PA students withdrew from their program before the end of the fall semester in 2005.

## Validity and Reliability of Study Instrument

Principal component factor analysis was conducted on the responses to the sixty-eight items on the MAHPMS survey by this study sample and the results compared to the factor analysis reported on the instrument in the Perrot et al. study. (Perrot et al., 2001). Only variables with loading values of 0.32 or above were interpreted. (Comrey and Lee, 1992). The items of the instrument used in this study showed similar loading patterns for the goal orientation items as the previous study. As in the Perrot et al. study, the each of the goal orientation subscales (mastery, performance, and alienation) loaded on the principal components identified by this statistical analysis. The items previously identified as relating to mastery goal orientation loaded on Factor 1 (eigenvalue = 9.49, % variance = 13.96), while the items identified as relating to performance goal orientation loaded on Factor 2 (eigenvalue = 7.38, % variance = 10.77). While these items loaded similarly to the Perrot et al. study, they exhibited smaller loading values than the previous study, ranging from 0.343 (poor) to 0.498 (fair) for the mastery goal orientation items and 0.366 (poor) to 0.645 (very good) for the performance goal orientation. (Comrey and Lee, 1992). Of interest with this group of subjects was that the items relating to alienation to learning goal orientation loaded on Factor 1 with the mastery goal items, but they loaded negatively (-0.388 to -0.626).

The items attributed to learning strategies, metacognitive learning strategies (LSM) and noncognitive learning strategies (LSN), did not load on independent factors but instead loaded predominantly on the same two factors as the mastery goal orientation (GOM), the performance goal orientation (GOP), and the alienation goal

orientation (GOA). This loading pattern indicated that the items thought to contribute to learning strategy preferences may not be independent constructs from the goal orientation preferences. In the same way, three locus of control survey items loaded similarly to the performance goal orientation and the alienation goal orientation. Reviewing the questions originally assigned to learning strategies and locus of control that loaded with the goal orientation items, it appeared likely to me that these questions may not differentiate goal orientation from learning strategies or locus of control based upon the definitions of the constructs. Consequently, the survey items on the study instrument were re-assigned to motivation scales that agreed with the item loading patterns for the purposes of this study. Seven items for the locus of control preference loaded independently and could be categorized accordingly as either external (LCE) or internal (LCI) locus of control items. Two questions, “When I study, I try to decide what I am supposed to learn rather than just read over the material” (#46) and “I read information over and over again” (#55) failed to load with an interpretable result and were removed from analysis for this study. Cronbach’s alpha coefficient for the instrument was  $\alpha = 0.824$ .

### Demographics of the Study Sample

The mean age for the student subjects participating in the research was 25.3 years. The mean age of the participants was similar for both administrations of the MAHPMS. Over 50% (55.6%) of the student subjects were younger than 25 years of age. Over 40% (43.8%) of the participants were age 25 and older. Of those subject aged 25 and older, only about 5% (4.6%) of the students in the study were over the age



of 35. The mean age and age distribution percentages were similar for the student participants in both educational programs and for both administrations of the study survey.

The total student sample consisted of 42.5% males and 57.5% females. When the sample was examined by professional program, the medical students were more evenly split between males and females, while the physician assistant students were predominantly female with a female to male ratio of almost 6:1. All ethnic group choices were represented by the study sample. Caucasians represented the majority of the student sample. Almost one-quarter of the students were Asian or Pacific Islander, followed by Mexican American/Hispanic and African American with 9.2% and 2.0%, respectively. Five percent of the respondents selected “other” as their ethnic category. When separated out by program, the physician assistant students were a less diverse sample than the medical school students, consisting primarily of Caucasians and Mexican Americans/Hispanics (81.5% and 14.8%, respectively). The majority of the students in both programs were single (73.9%) and had no children when enrolled (86.9%). This was the first application to their respective programs for almost two-thirds of the students. As for undergraduate major categories, the overwhelming majority in any one category was the biological or life sciences (61.4 %). The next highest frequencies for undergraduate major categories tied at 7.8% were math/engineering/computer science and social science majors. Student subjects who majored in chemistry or biochemistry comprised 6.5% of the sample, followed by language/humanities/art/religion, health professions, business and “other.” (See Table 1.)

Table 1

*Demographic Frequencies in Percentages for the Study Sample*

| July 2005<br>MAHPMS  | % Total<br>(N = 153) | % DO<br>(n = 126) | % PA<br>(n = 27) | December 2005<br>MAHPMS | % Total<br>(N = 63) | % DO<br>(n = 42) | % PA<br>(n = 21) |
|----------------------|----------------------|-------------------|------------------|-------------------------|---------------------|------------------|------------------|
| Gender               |                      |                   |                  | Gender                  |                     |                  |                  |
| Male                 | 42.5                 | 48.4              | 14.8             | Male                    | 31.7                | 45.2             | 4.8              |
| Female               | 57.5                 | 51.6              | 85.2             | Female                  | 68.3                | 54.8             | 95.2             |
| Mean Age             | 25.3                 | 25.1              | 26.2             | Mean Age                | 26.0                | 26.0             | 26.1             |
| Age Distribution (%) |                      |                   |                  | Age Distribution (%)    |                     |                  |                  |
| < 25 years           | 55.6                 | 56.3              | 51.9             | < 25 years              | 52.4                | 54.8             | 47.6             |
| ≥ 25 years           | 43.8                 | 42.9              | 48.1             | ≥ 25 years              | 47.6                | 45.2             | 52.4             |
| Missing data         | 0.7                  | 0.8               | --               | Missing data            | --                  | --               | --               |
| Marital Status       |                      |                   |                  | Marital Status          |                     |                  |                  |
| Single               | 73.9                 | 76.2              | 63.0             | Single                  | 65.1                | 69.0             | 57.1             |
| Married              | 24.8                 | 22.2              | 37.0             | Married                 | 34.9                | 31.0             | 42.9             |
| Divorced             | 1.3                  | 1.6               | --               | Divorced                | --                  | --               | --               |
| Ethnicity            |                      |                   |                  | Ethnicity               |                     |                  |                  |
| African American     | 2.0                  | 1.6               | 3.7              | African American        | 1.6                 | 2.4              | --               |
| Asian/Pac Islander   | 22.9                 | 27.8              | --               | Asian/Pac Islander      | 11.1                | 16.7             | --               |
| Cauc/White           | 60.8                 | 56.3              | 81.5             | Cauc/White              | 76.2                | 69.0             | 90.5             |
| Mex Amer/Hisp        | 9.2                  | 7.9               | 14.8             | Mex Amer/Hisp           | 4.8                 | 2.4              | 9.5              |
| Other                | 5.2                  | 6.3               | --               | Other                   | 6.3                 | 9.5              | --               |
| Children             |                      |                   |                  | Children                |                     |                  |                  |
| Yes                  | 13.1                 | 12.7              | 14.8             | Yes                     | 12.7                | 11.9             | 14.3             |
| No                   | 86.9                 | 87.3              | 85.2             | No                      | 87.3                | 88.1             | 85.7             |
| First Application    |                      |                   |                  | First Application       |                     |                  |                  |
| Yes                  | 68.0                 | 70.6              | 55.6             | Yes                     | 66.7                | 69.0             | 61.9             |
| No                   | 26.8                 | 25.4              | 33.3             | No                      | 30.1                | 28.6             | 33.3             |
| Missing data         | 5.2                  | 4.0               | 11.1             | Missing data            | 3.2                 | 2.4              | 4.8              |
| Undergraduate Major  |                      |                   |                  | Undergraduate Major     |                     |                  |                  |
| Biol Science         | 61.4                 | 57.1              | 81.5             | Biol Science            | 63.5                | 54.8             | 81.0             |
| Chemistry            | 6.5                  | 7.9               | --               | Chemistry               | 7.9                 | 11.9             | --               |
| Math/Eng/Comp        | 7.8                  | 9.6               | --               | Math/Eng/Comp           | 3.2                 | 4.8              | --               |
| Social Science       | 7.8                  | 8.7               | 3.7              | Social Science          | 6.3                 | 7.1              | 4.8              |
| Lang/Hum/Art/Rel     | 4.6                  | 4.8               | 3.7              | Lang/Hum/Art/Rel        | 3.2                 | 4.8              | --               |
| Health Prof          | 3.9                  | 3.2               | 7.4              | Health Prof             | 7.9                 | 7.1              | 9.5              |
| Business             | 3.9                  | 4.0               | 3.7              | Business                | 6.3                 | 7.1              | 4.8              |
| Other                | 3.3                  | 4.0               | --               | Other                   | 1.6                 | 2.4              | --               |

## Distribution of Learning Motivation Subscales

To determine goal orientation (GO) and locus of control (LC) learning preferences for each of the study subjects, the survey items that were attributed to each

subscale were totaled and averaged to get a mean learning preference subscale score. The subscale score with the highest mean was considered the individuals learning preference in that category. Learning strategy items were reclassified into their related goal orientation subscales as indicated by the factor analysis performed on the instrument. As a result, this study used the following five learning preference scores for its statistical analyses: mastery goal orientation (GOM), performance goal orientation (GOP), alienation to learning goal orientation (GOA), internal locus of control (LCI), and external locus of control (LCE). In addition, based upon survey responses, GOT goal orientation represented students whose scores indicated equal mean scores for both mastery and performance goal orientations, and LCT represented students whose scores indicated equal means for both the LCI and LCE scores.

For the 153 subjects who were included at the first administration of the Modified Archer's Health Professions Motivation Scale (MAHPMS), almost three-fourths (72.5%) preferred a mastery goal orientation (GOM) to learning, while 26.1% preferred the performance goal orientation (GOP) to learning. Two students showed no particular learning preference (equal scores on the mastery and performance subscales) with respect to goal orientation. No student exhibited alienation to learning (GOA) goal orientation preference at the beginning of the fall 2005 semester. When the subjects were separated by educational programs, both groups of students revealed predominant mastery goal preferences and similar percentage frequency distributions between mastery and performance goal orientation preferences. For both programs, no student preferred alienation to learning. Similarly, goal orientation preference by the

students in the second administration of the study survey remained predominantly mastery oriented, followed by motivation related to performance goals. (See Table 2.)

Similarly the locus of control motivation scale demonstrated an internal locus of control for the majority (71.9%) of this student sample. External locus of control preferences were demonstrated in about one-fourth (24.8%) of the study subjects at the beginning of the semester. Five students demonstrated equal mean scores between internal locus of control items and external locus of control items. The high incidence of an internal locus of control preference was evidenced for all groups of students both at the beginning and the end of the semester. However, internal locus of control preference frequencies decreased for the medical students and increased for the PA students who participated in the study at the end of the semester. (See Table 2.)

Table 2

*Summary of Student Preferences for MAHPMS Learning Motivation Scales Both Administrations of Instrument*

| July 2005<br>Learning Preferences | % Total<br>(N = 153) | % DO<br>(n = 126) | % PA<br>(n = 27) | December 2005<br>Learning Preferences | % Total<br>(N = 63) | % DO<br>(n = 42) | % PA<br>(n = 21) |
|-----------------------------------|----------------------|-------------------|------------------|---------------------------------------|---------------------|------------------|------------------|
| <i>Goal Orientation</i>           |                      |                   |                  | <i>Goal Orientation</i>               |                     |                  |                  |
| Mastery (GOM)                     | 72.5                 | 71.4              | 77.8             | Mastery (GOM)                         | 73.0                | 71.4             | 76.2             |
| Performance (GOP)                 | 26.1                 | 27.0              | 22.2             | Performance (GOP)                     | 25.4                | 26.2             | 23.9             |
| Alienation (GOA)                  | --                   | --                | --               | Alienation (GOA)                      | --                  | --               | --               |
| Equal GOM & GOP (GOT)             | 1.4                  | 1.6               | --               | Equal GOM & GOP (GOT)                 | 1.6                 | 2.4              | --               |
| <i>Locus of Control</i>           |                      |                   |                  | <i>Locus of Control</i>               |                     |                  |                  |
| Internal (LCI)                    | 71.9                 | 73.0              | 66.7             | Internal (LCI)                        | 65.1                | 57.1             | 81.0             |
| External (LCE)                    | 24.8                 | 24.6              | 25.0             | External (LCE)                        | 31.7                | 38.1             | 19.0             |
| Equal (LCT)                       | 3.3                  | 2.4               | 7.3              | Equal (LCT)                           | 3.2                 | 4.8              | --               |

## Research Questions

For Research Question 1: Is there a significant relationship between motivation, as measured by goal orientation, learning strategy, and locus of control, and the academic performance of medical and physician assistant students at UNTHSC?

For the total study sample ( $N = 153$ ) simultaneous and stepwise multiple regression, using five motivation subscales, identified by factor analysis, as the independent variables and the cumulative semester average as the dependent variable were performed. One course in the Texas College of Osteopathic Medicine, Osteopathic Manipulative Medicine, and one course in the PA program, Physical Exam Skills, were included in the end-of-semester grade average calculations, but also analyzed separately. These courses measure psychomotor skills and assess performance primarily based upon the mastery model, as opposed to the achievement model which is predominant in other semester courses. I anticipated that these two courses would not have enough variance in their final scores to contribute to the analyses. However, the courses did show an appropriate range and distribution of scores so that they could be included in the end of semester grade averages for analyses. One medical school course was not included in the analysis. Clinical Medicine, the medical school physical exam course, was not included because grades for that course were not available at the end of the first semester.

When entered simultaneously, the five predictor variables did not produce any statistically significant relationship between the learning motivation scores and the cumulative semester average ( $p = 0.329$ ) for the total group of students. When the study subjects were examined by program, the 126 medical school students did not reveal a statistically significant relationship between the predictor variables and their cumulative semester averages ( $p = 0.867$ ). On the other hand, the 27 physician assistant students did indicate a statistically significant correlation between the combined learning motivation scores and their semester averages when the variables were entered

simultaneously ( $p = 0.004$ ). The Pearson  $r$  correlation coefficient was 0.737, with an  $R^2 = 0.544$ . (See Table 3.)

Table 3

*Results of Simultaneous Multiple Regression between Learning Motivation Scores and Cumulative Semester Averages, July 2005 MAHPMS Administration*

|                                | Pearson $r$ | $R^2$ | <u>Sig. (<math>p</math>)</u> |
|--------------------------------|-------------|-------|------------------------------|
| Total Sample ( $N = 153$ )     | 0.195       | 0.038 | 0.329                        |
| Medical Students ( $n = 126$ ) | 0.124       | 0.015 | 0.867                        |
| PA Students ( $n = 27$ )       | 0.737       | 0.544 | 0.004*                       |

\* Indicates significance to the  $p < 0.05$  level

Stepwise multiple regression, where the independent variables are entered and/or removed one at a time based upon a statistical formula, yielded statistically significant results. Using this technique, with the data from the July 2005 survey, the alienation to learning goal orientation scores alone revealed a statistically significant relationship with the end-of-semester cumulative grade averages for the 153 subjects ( $p = 0.048$ ). The strength of the relationship, however, was very small with a Pearson  $r = 0.160$  and an  $R^2 = 0.026$ . The learning motivation scores of the PA students when examined separately demonstrated the same independent variable (GOA) with a statistically significant correlation to the semester grades (Pearson  $r = 0.637$ ,  $R^2 = 0.406$ ,  $p = 0.001$ ). None of the relationships between the independent motivation scale variables and the end-of-semester grades were statistically significant for the medical students using stepwise linear regression. (See Table 4.)

The 63 health professions students who participated in the Modified Archer's Health Professions Motivation Scale at the end of the fall 2005 semester exhibited different results when multiple regression analysis was performed on the learning

motivation predictor variables and the dependent variable, cumulative semester grade averages. Simultaneous multiple regression resulted in a statistically significant

Table 4

*Results of Stepwise Multiple Regression between Learning Motivation Scores and Cumulative Semester Averages, July 2005 MAHPMS Administration*

|   | Pearson $r$ | $R^2$ | Sig. ( $p$ ) |
|---|-------------|-------|--------------|
| Total Sample ( $N = 153$ )<br><i>Alienation to Learning Goal Orientation (entered 1<sup>st</sup>)</i><br><i>All other variables removed</i> | 0.160       | 0.026 | 0.048*       |
| Medical Students ( $n = 126$ )<br><i>All variables entered and removed without sig.</i>   | --          | --    | --           |
| PA Students ( $n = 27$ )<br><i>Alienation to Learning Goal Orientation (entered 1<sup>st</sup>)</i><br><i>All other variables removed</i>   | 0.637       | 0.406 | 0.001*       |

\* Indicates significance to the  $p < 0.05$  level

relationship between the predictor variables and the semester averages when entered simultaneously (Pearson  $r = 0.558$ ,  $R^2 = 0.311$ ,  $p = 0.001$ ). When analyzed separately, neither the medical students' nor the physician assistant students' motivation subscale scores exhibited a statistically significant relationship with their end-of-semester grades ( $p = 0.102$  and  $p = 0.070$ , respectively). (See Table 5.)

Table 5

*Results of Simultaneous Multiple Regression between Learning Motivation Scores and Cumulative Semester Averages, December 2005 MAHPMS Administration*

|                               | Pearson $r$ | $R^2$ | Sig. ( $p$ ) |
|-------------------------------|-------------|-------|--------------|
| Total Sample ( $N = 63$ )     | 0.558       | 0.311 | 0.001*       |
| Medical Students ( $n = 42$ ) | 0.467       | 0.218 | 0.102        |
| PA Students ( $n = 21$ )      | 0.681       | 0.463 | 0.070        |

\* Indicates significance to the  $p < 0.05$  level

Stepwise multiple regression analysis of the data from the 63 subjects in December 2005 also revealed different relationships between the variables than at the beginning of the semester. Mastery goal orientation scores, when entered first, demonstrated a statistically significant relationship with semester grades ( $R^2 = 0.197$ ,  $p = 0.001$ ). When external locus of control scores were added to the mastery goal orientation scores, the strength of the statistically significant relationship increased slightly ( $R^2 = 0.266$ ,  $p = 0.021$ ). For the 42 medical students in this group of subjects, one of the motivation subscale scores, mastery goal orientation, statistically significantly correlated with cumulative semester averages when entered stepwise ( $R^2 = 0.162$ ,  $p = 0.008$ ). Interestingly, for the physician assistant students' scores, the performance goal orientation scores revealed a statistically significant relationship with semester grades when entered first ( $R^2 = 0.319$ ,  $p = 0.008$ ), and all the other variables removed. (See Table 6.)

Table 6

*Results of Stepwise Multiple Regression between Learning Motivation Scores and Cumulative Semester Averages, December 2005 MAHPMS Administration*

|   | Pearson $r$ | $R^2$ | Sig. ( $p$ ) |
|---|-------------|-------|--------------|
| Total Sample ( $N = 63$ )                               |             |       |              |
| Mastery Goal Orientation (entered 1 <sup>st</sup> )     | 0.444       | 0.197 | 0.001*       |
| External Locus of Control (added 2 <sup>nd</sup> )      | 0.515       | 0.266 | 0.021*       |
| All other variables removed without significance        |             |       |              |
| Medical Students ( $n = 42$ )                           |             |       |              |
| Mastery Goal Orientation (entered 1 <sup>st</sup> )     | 0.403       | 0.162 | 0.008*       |
| All other variables removed without significance        |             |       |              |
| PA Students ( $n = 21$ )                                |             |       |              |
| Performance Goal Orientation (entered 1 <sup>st</sup> ) | 0.546       | 0.319 | 0.008*       |
| All other variables removed without significance        |             |       |              |

\* Indicates significance to the  $p < 0.05$  level



Simultaneous and stepwise linear regression analyses were performed, using the five learning motivation scores as the predictor variables, and each semester course grade as the dependent variable to determine any statistically significant relationships between learning motivations and individual course grades. Since the medical students and the physician assistant students take different courses, the analyses had to be done with the study subjects split by program.

At the beginning of the fall semester, no statistically significant relationships appeared between learning motivation scores and individual course grades for the 126 medical school participants with simultaneous linear regression procedures. (See Table 7.) Likewise, stepwise regression analyses revealed no statistically significant relationships between the independent and dependent variables. All five learning motivation scores were entered and removed individually without statistical significance for predicting any of the fall semester medical school courses.

Table 7

*Results of Simultaneous Multiple Regression between Learning Motivation Scores and Semester Course Grades for Medical Students, July 2005 MAHPMS Administration*

|                            | Pearson $r$ | $R^2$ | Sig. ( $p$ ) |
|----------------------------|-------------|-------|--------------|
| Total Sample ( $N = 126$ ) |             |       |              |
| Cell Science               | 0.141       | 0.020 | 0.785        |
| Musculoskeletal/Skin 1     | 0.137       | 0.019 | 0.804        |
| Nervous System 1           | 0.157       | 0.025 | 0.708        |
| Endocrine 1                | 0.173       | 0.030 | 0.614        |
| Osteopathic Manip Med      | 0.117       | 0.014 | 0.899        |

\* Indicates significance to the  $p < 0.05$  level

End of semester analyses yielded different results for the medical student courses. The endocrinology course grade showed a statistically significant relationship

with the learning motivation scores when the scores were entered simultaneously (Pearson  $r = 0.559$ ,  $R^2 = 0.312$ ,  $p = 0.016$ ). (See Table 8.)

Table 8

*Results of Simultaneous Multiple Regression between Learning Motivation Scores and Semester Course Grades for Medical Students, December 2005 MAHPMS Administration*

|                           | Pearson $r$ | $R^2$ | Sig. ( $p$ ) |
|---------------------------|-------------|-------|--------------|
| Total Sample ( $N = 42$ ) |             |       |              |
| Cell Science              | 0.436       | 0.190 | 0.162        |
| Musculoskeletal/Skin 1    | 0.383       | 0.147 | 0.312        |
| Nervous System 1          | 0.472       | 0.223 | 0.092        |
| Endocrine 1               | 0.559       | 0.312 | 0.016*       |
| Osteopathic Manip Med     | 0.445       | 0.198 | 0.142        |

\* Indicates significance to the  $p < 0.05$  level

Stepwise regression, however, uncovered several statistically significant relationships regarding the predictor variables and the individual course grades. When entered first and all the other predictor variables removed, the mastery goal orientation (GOM) scores revealed a small statistically significant correlation to the end of semester grade for the medical school's Cell Science course (Pearson  $r = 0.353$ ,  $R^2 = 0.125$ ,  $p = 0.022$ ). Likewise the GOM scores and the semester grade for the Nervous System I course were statistically significantly correlated (Pearson  $r = 0.451$ ,  $R^2 = 0.203$ ,  $p = 0.003$ ). External locus of control (LCE) scores related with statistical significance to the endocrinology course grade (Pearson  $r = 0.417$ ,  $R^2 = 0.174$ ,  $p = 0.006$ ), and the performance goal orientation learning (GOP) scores were statistically correlated to the Osteopathic Manipulative Medicine course at the end of the semester (Pearson  $r = 0.381$ ,  $R^2 = 0.145$ ,  $p = 0.013$ ). No statistically significant relationship emerged for any of the learning motivation scores and the semester grade for Musculoskeletal/Skin I course when entered stepwise into linear regression analysis.

For the physician assistant students who participated in the study, both simultaneous and stepwise regression analyses revealed statistically significant relationships between the predictor learning motivation variables and the semester course grades. At the beginning of the fall semester 2005, simultaneous linear regression revealed statistically significant relationships between the learning motivation variables and two course grades. Statistically significant relationships existed for the Basic Human Science course (Pearson  $r = 0.732$ ,  $R^2 = 0.536$ ,  $p = 0.004$ ) and the Epidemiology course (Pearson  $r = 0.656$ ,  $R^2 = 0.430$ ,  $p = 0.028$ ). No statistically significant relationship existed between the predictor variables and the Physical Exam Skills course (Pearson  $r = 0.603$ ,  $R^2 = 0.363$ ,  $p = 0.072$ ) or the Introduction to Master's Project course (Pearson  $r = 0.563$ ,  $R^2 = 0.316$ ,  $p = 0.130$ ) when entered simultaneously.

For the PA student participants, stepwise regression analyses for the predictor variables measured at the beginning of the semester indicated one predictor variable that statistically correlated with all four of the course grades when entered in stepwise fashion. Alienation to learning goal orientation (GOA) scores correlated with statistical significance to all PA fall semester course grades. Alienation to learning statistically significantly related to the Basic Human Science course grade (Pearson  $r = 0.621$ ,  $R^2 = 0.385$ ,  $p = 0.001$ ), the Physical Exam Skills course grade (Pearson  $r = 0.472$ ,  $R^2 = 0.223$ ,  $p = 0.013$ ), the Epidemiology course grade (Pearson  $r = 0.581$ ,  $R^2 = 0.338$ ,  $p = 0.001$ ), and the Introduction to Master's Project course grade (Pearson  $r = 0.446$ ,  $R^2 = 0.199$ ,  $p = 0.020$ ) when this variable was entered first and all other variables were removed.

By the end of the semester the Basic Human Science course was the only course that revealed a statistically significant correlation (Pearson  $r = 0.705$ ,  $R^2 = 0.498$ ,  $p = 0.046$ ) between learning motivation variables and the course grade when the predictor variables were entered simultaneously. (See Table 9.)

Table 9

*Results of Simultaneous Multiple Regression between Learning Motivation Scores and Semester Course Grades for Physician Assistant Students, December 2005 MAHMPS Administration*

|                           | Pearson $r$ | $R^2$ | Sig. ( $p$ ) |
|---------------------------|-------------|-------|--------------|
| Total Sample ( $N = 21$ ) |             |       |              |
| Basic Human Sciences      | 0.705       | 0.498 | 0.046*       |
| Physical Exam Skills      | 0.552       | 0.305 | 0.309        |
| Epidemiology              | 0.571       | 0.326 | 0.263        |
| Intro to Master's Project | 0.414       | 0.172 | 0.686        |

\* Indicates significance to the  $p < 0.05$  level

Using stepwise linear regression, alienation to learning goal orientation (GOA) scores continued to emerge as a statistically significant predictor variable for the Basic Human Science course grade (Pearson  $r = 0.597$ ,  $R^2 = 0.357$ ,  $p = 0.004$ ) when entered first and all other variables were removed. Performance goal orientation (GOP) scores appeared to emerge as a statistically significant factor for the Physical Exam Skills course grades (Pearson  $r = 0.478$ ,  $R^2 = 0.229$ ,  $p = 0.028$ ). No predictor variables emerged as statistically significant in their relationship the Epidemiology course grades and the Introduction to Master's Project course grades by the end of the semester when entered one at a time.

For Research Question 2: Are there significant differences in goal orientation, learning strategy, and locus of control items within the medical and physician assistant student populations at UNTHSC?

Repeated measures within subjects analysis of variance (ANOVA) was utilized to determine if there were statistically significant differences in the five learning motivation subscales (GOM, GOP, GOA, LCI, and LCE) within the groups of subjects for the two different administrations of the motivation survey instrument. For this group of subjects homogeneity of covariance could not be assumed using the Mauchly's test sphericity ( $p = 0.001$ ). Because of this, I was required to use one of the more conservative tests to determine statistical significance, such as Greenhouse-Geisser or the Huynh-Feldt to test the null hypothesis. For the 63 subjects who completed both administrations of the MAHPMS survey, there was no statistically significant difference for the interaction effect between the main effect, MAHPMS scores, and the two administrations of the instrument (Greenhouse-Geisser:  $F = 2.092$ ,  $p = 0.121$ ). Similarly there was no statistically significant interaction effect for the two administrations of the learning motivation survey instrument evidenced with the medical school participants when the study subjects were separated into their respective educational program (Greenhouse-Geisser:  $F = 1.932$ ,  $p = 0.146$ ). For the PA student subjects, on the other hand, within subjects ANOVA analysis showed a statistically significant difference in the interaction effect between the main effect, MAHPMS scores, and the two administrations of the instrument (Greenhouse-Geisser:  $F = 3.297$ ,  $p = 0.041$ ).

For Research Question 3: Are there differences in the motivation scales between demographic categories of students and between students in the two educational programs?

One way analysis of variance (ANOVA) statistical procedures were utilized to explore differences between the mean scores of the five motivation subscales when examined by demographic categories and by educational programs.

## Program

Using educational program as the independent variable and the five learning motivation preference scores as the dependent variables, one-way ANOVA was performed. For the 153 subjects at the beginning of the fall 2005 semester, the Levene statistic demonstrated that homogeneity could not be assumed for the mastery goal orientation variable ( $p = 0.031$ ), therefore ANOVA could not be utilized for that variable. All other variables revealed homogeneity of variance based upon the Levene statistic. At the beginning of the semester, there were no statistically significant differences to  $p < 0.05$  between the mean scores for the learning motivation scales based upon the educational program that the subjects attended. At the end of the semester, the Levene statistic indicated that homogeneity of variance could be assumed for all dependent variables. The mean scores for two learning motivation variables showed statistically significant differences between the students in the two educational programs. On average the subjects that attended the medical school scored statistically significantly higher than the PA students for alienation to learning goal orientation ( $F = 11.316$ ,  $p = 0.001$ ) and for external locus of control ( $F = 4.482$ ,  $p = 0.038$ ).

## Gender

Using gender as the independent variable and the five learning motivation preference scores as the dependent variables, one-way ANOVA was performed. At the beginning of the semester, the Levene statistic indicated that all the scores met the assumption of homogeneity of variance for all dependent variables, and the one-way ANOVA could be utilized for the analysis. In July 2005, on average males (mean score

= 3.863) scored statistically significantly lower than females (mean score = 4.111) for mastery goal orientation ( $F = 15.562, p = 0.001$ ). In addition, male students scored statistically significant lower (mean score = 3.985) than their female counterparts (mean score = 3.693) for internal locus of control ( $F = 5.561, p = 0.020$ ). There were no statistically significant differences for the mean scores relating to performance goal orientation, alienation goal orientation, and internal locus of control when examined by gender.

For the end of semester measurements, Levene tests revealed that the basic assumption for homogeneity of variance could not be made for the alienation goal orientation variable and the analysis was not performed on that variable. Examining the other outcome variables, males on average scored statistically significantly lower (mean = 3.660) than females (mean = 4.018) for mastery goal orientation ( $F = 8.325, p = 0.005$ ). No statistically significant differences in mean scores emerged for performance goal orientation, internal locus of control and external locus of control when examined by gender in December 2005.

### Age

The ages of the 153 study subjects were divided into the following two categories for statistical analysis in order to create more balanced cell sizes and to look at the differences between younger and older students: 1) age less than 25 years old and 2) age 25 years or older. Using these two age categories as the independent variables and the five learning motivation preference scores as the dependent variables, one-way ANOVA was performed. Levene statistics indicated that the assumption for

homogeneity of variance could be assumed for all five dependent variables. ANOVA revealed statistically significant differences in the mean scores between younger and older students for four of the five variables. (See Table 10.) Older students scored statistically significantly higher than younger students on mastery goal orientations, while younger students scored statistically significantly higher on performance goal orientations, alienation to learning, and external locus of control. No statistically significant differences were found based upon age category for internal locus of control scores.

Table 10

*One-way ANOVA for Learning Motivation Scores by Age Categories, July 2005  
MAHPMS Administration*

|                                    | <i>N</i> | Mean Score | <i>F</i> -value | Sig. ( <i>p</i> ) |
|------------------------------------|----------|------------|-----------------|-------------------|
| Total Sample                       | 153      |            |                 |                   |
| Master goal orientation (GOM)      |          |            | 4.333           | 0.039*            |
| Age younger than 25 years          | 85       | 3.950      |                 |                   |
| Age 25 years or older              | 67       | 4.085      |                 |                   |
| Performance goal orientation (GOP) |          |            | 6.234           | 0.014*            |
| Age younger than 25 years          | 85       | 3.710      |                 |                   |
| Age 25 years or older              | 67       | 3.510      |                 |                   |
| Alienation goal orientation (GOA)  |          |            | 6.996           | 0.009*            |
| Age younger than 25 years          | 85       | 2.530      |                 |                   |
| Age 25 years or older              | 67       | 2.300      |                 |                   |
| Internal Locus of Control (LCI)    |          |            | 5.736           | 0.557             |
| Age younger than 25 years          | 85       | 3.729      |                 |                   |
| Age 25 years or older              | 67       | 3.403      |                 |                   |
| External Locus of Control (LCE)    |          |            | 6.946           | 0.018*            |
| Age younger than 25 years          | 85       | 3.331      |                 |                   |
| Age 25 years or older              | 67       | 3.044      |                 |                   |

\* Indicates significance to the  $p < 0.05$  level

With Levene statistics showing homogeneity of variance assumed for all variables, ANOVA analysis of the same independent and dependent variables was performed for the end of semester measurements. Only two learning motivation mean scores emerged as statistically significantly different for the two age categories. For the 63 subjects at the end of the semester, students younger than age 25 years scored



statistically significantly higher (mean = 3.703) than students age 25 and older (mean = 3.351) on the performance goal orientation variable ( $F = 7.410$ ,  $p = 0.008$ ). The younger students also scored on average statistically significantly higher (mean = 2.600) than older students (mean = 2.304) on the alienation to learning variable ( $F = 4.925$ ,  $p = 0.030$ ).

### Marital Status

For the purposes of ANOVA analysis, the marital status was categorized into single and married only. Only two out of the 153 subjects marked divorced. All other subjects marked either single or married. Since it was assumed that divorced subjects would mark married if they were remarried, the two divorced subjects were placed into the single category. For the 63 subjects at the end of the semester, all participants marked either single or married. Using these two marital status categories as the independent variables and the five learning motivation scores as the dependent variables, one-way ANOVA was performed.

For the 153 students subjects in July 2005, Levene statistics indicated that the assumption for homogeneity of variance was not assumed for the mastery goal orientation dependent variable, therefore ANOVA was not performed on that variable. Homogeneity of variance could be assumed for all other variables. Only one learning motivation variable revealed a statistically significant difference between the mean scores when examined by marital status category. Single students scored statistically significantly higher (mean = 3.665) on the external locus of control variable than the married students (mean = 3.342 and  $F = 1.490$ ,  $p = 0.040$ ). No statistically significant

differences to  $p < 0.05$  were found on mean scores for performance goal orientation, alienation to learning, and external locus of control when explored by single or married categories.

By the end of the semester all dependent variables could be analyzed based upon Levene statistics for homogeneity of variance, however, no learning motivation mean score emerged as statistically significantly different to  $p < 0.05$  between the two marital status categories for all five variables.

### Ethnicity

Since the distribution of subjects by ethnicity resulted in a highly unequal number cell scores, the ethnicity was reclassified into the following categories for analysis: 1) Caucasian; 2) Asian/Pacific Islander; 3) Minority (Hispanic and African American); and 4) other. This classification produced the following number of individual cell scores for the subjects at the beginning of the semester: 1) Caucasian ( $n = 93$ ); 2) Asian/Pacific Islander ( $n = 35$ ); 3) Minority (Hispanic and African American,  $n = 17$ ); and 4) other ( $n = 8$ ). Homogeneity of variance could be assumed for all five dependent variables based upon Levene statistics. No statistically significant differences to  $p < 0.05$  in the mean scores for any of the five learning motivation scales were found when compared based upon ethnic category.

At the end of the semester, this ethnic classification resulted in the following numbers: 1) Caucasian ( $n = 48$ ); 2) Asian/Pacific Islander ( $n = 7$ ); 3) Minority (Hispanic and African American,  $n = 4$ ); and 4) other ( $n = 4$ ). Again, homogeneity of variance could be assumed for all five variables. Based upon one-way ANOVA analysis, two

variables, alienation to learning ( $F = 3.088$ ,  $p = 0.034$ ) and external locus of control ( $F = 2.804$ ,  $p = 0.047$ ), showed statistical significance in regards to mean scores when classified by ethnic categories. Upon further examination using Sheffe post hoc testing, it appeared that Asian/Pacific Islander subjects scored statistically significantly higher (mean = 2.998) on alienation to learning than their Caucasian peers (mean = 2.380,  $p = 0.034$ ). Examination of the external locus of control for the four ethnic categories did not uncover statistically significant differences among any of the categories when using the Sheffe post hoc analysis.

### Children

The presence or absence of children in the home was utilized as an independent variable for the student participants to determine whether that factor played any role in the scores on the learning motivation variables. Homogeneity of variance for the performance goal orientation variable could not be assumed at the beginning of the semester according to its Levene statistic. All other outcome variables for both administrations of the MAHPMS survey showed homogeneity of variance and were analyzed using one-way ANOVA. No statistically significant differences to  $p < 0.05$  between mean scores were found when examining all the learning motivation variables based upon the presences or absence of children in the home. This lack of statistically significant results was displayed for both administrations of the survey instrument.

### First Application to Program

Whether or not a student was entering their respective programs on their first

application or after multiple applications was also examined to explore whether this independent variable influenced the dependent variables of learning motivation scores. One outcome variable, alienation to learning, was eliminated from analysis at the beginning of the semester, based upon the Levene test for homogeneity of variance. At the end of the semester, the internal locus of control variable was eliminated from analysis based upon the Levene statistic for homogeneity of variance. All other outcome variables for both administrations of the MAHPMS survey showed homogeneity of variance and were analyzed using one-way ANOVA. No statistically significant differences to  $p < 0.05$  between mean scores were found when the learning motivation variables were examined based upon whether multiple applications were required before admission and matriculation. This lack of statistically significant results was displayed for both administrations of the survey instrument.

#### Undergraduate Major

Another independent variable of interest was the students' undergraduate major prior to admission to medical school or PA school. With all eight categories of undergraduate majors utilized as independent variables and learning motivation preference scores utilized as dependent variables, one-way ANOVA was performed for the data collected at the beginning of the fall 2005 semester. Homogeneity of variance could be assumed for all five dependent variables based upon the Levene statistics. No statistically significant differences to  $p < 0.05$  in mean scores for learning motivation emerged when examined by these eight categories of undergraduate major.

When using all eight undergraduate major categories for the 63 study subjects at the end of the semester, cell sizes were reduced to small numbers ( $n$  ranging from 1-5), with several cells representing  $n = 1$  or  $n = 2$  subjects. These small cell sizes could not be adequately examined for analysis of variance. Therefore, because of the very large biological science undergraduate major category compared to the other categories of undergraduate major, this variable was then classified into the following two undergraduate major categories for purposes of analysis: 1) biological science majors ( $n = 94$ ) and 2) non-biological science majors ( $n = 58$ ) in order to produce more balance in cell sizes for ANOVA. The non-biological science majors included: chemistry, math/engineering/computer science, social sciences, language/humanities, other health professions, business, and an “other” category. ANOVA was then performed on both MAHMPS measurements using these two undergraduate major categories as independent variables.

Homogeneity of variance could not be assumed for external locus of control based upon the Levene statistic and was eliminated from the analysis at the beginning of the semester. For the remaining outcome variables (mastery goal orientation, performance goal orientation, alienation to learning, and internal locus of control), no statistically significant differences to  $p < 0.05$  in the mean scores for those variables were found based upon these two categories of undergraduate major.

At the end of the semester the study subjects represented 40 biological science majors and 23 non-biological science majors. Homogeneity of variance was assumed for all five outcome variables. No statistically significant differences to  $p < 0.05$  in the

mean scores for all five learning motivation variables were found based upon two categories of undergraduate major.

For Research Question 4: To what extent do these motivation scales, alone or in combination, predict successful (low-risk) or at-risk (high-risk) student performance, as measured in first semester course grades and first semester cumulative averages in medical and/or PA student outcomes?

Forward selection logistic regression was performed on the student subjects, using the five learning motivation scores as independent variables and the academically “high risk” and “low risk” category defined *a priori* as the dependent variable. In forward selection logistic regression, each independent variable (IV) is added one at a time. As the IV’s are added, level of significance for the IV toward the ability to predict the dependent variable is established. Only IVs with a  $p < 0.05$  are left in the model and all other variables  $p \geq 0.05$  are removed. Logistic regression is preferred over discriminant function analysis by many statisticians because of its flexible and robust nature of analysis without strict assumptions regarding the distribution of the variables and sample size. (Tabachnick and Fidell, 2001).

Forward selection logistic regression on the 153 subjects in the study at the beginning of the fall 2005 semester failed to reveal any learning motivation scores that showed statistical significance in predicting membership to the academically “high risk” category. All IV’s were systematically removed from the equation model without reaching a  $p < 0.05$  level of significance. This phenomenon was also noticed when the subjects were separated by educational program. The medical student sample ( $n = 126$ ) failed to establish any of the learning motivation scores as statistically significant predictors for the academically “high risk” category. On the other hand, the statistical analysis for 27 physician assistant students revealed that alienation to learning (GOA)

scores were statistically significant ( $p = 0.019$ ) in classifying academically “high risk” students 88.9% of the time.

Forward selection logistic regression on the 63 subjects in the study at the end of the fall 2005 semester students showed that external locus of control scores were statistically significant ( $p = 0.008$ ) in classifying academically “high risk” students 81.0% of the time for the total group of subjects. However, when separated into different educational program samples, none of the learning motivation scores emerged as statistically significant in the equation model for either the medical student group ( $n = 42$ ) or the physician assistant student group ( $n = 21$ ).

## CHAPTER 5

### CONCLUSIONS AND DISCUSSION

#### Study Sample

This study was designed as a non-experimental causal relationship study using a convenient representative sample of the available medical (doctor of osteopathy, DO) students and physician assistant (PA) students entering the University of North Texas Health Science Center at Fort Worth in fall 2005. The sample was not considered to be a randomized representative of the total population of all medical and PA students in the United States, and analysis for statistical power was not performed based upon the total population. Consequently, all statistically significant results could only be considered characteristic of this particular sample of medical students and PA students from this particular osteopathic medical school and this particular health sciences center in North Texas.

The 153 subjects who participated at the beginning of the semester were considered an adequate representative of the convenient sample targeted for the study. That number also met the “rule of thumb” for adequate cases-to-independent variables (cases:IV) ratio needed for multiple regression analyses using multiple independent variables. According to Tabachnick and Fidell (2001) an adequate cases:IV ratio should be  $N \geq 50 + 8(m)$ , where “m” equals the number of independent variables (IV’s). (Tabachnick and Fidell, 2001, p. 17). For this study, multiple linear regression analyses were performed using the five learning motivation mean scores as independent variables and cumulative semester grade averages and end-of-semester course grades as dependent variables. Therefore, for this study an adequate cases:IV ratio would be:



$N \geq 50 + 8(5)$  or  $N \geq 90$ . Consequently conclusions related to the statistical analyses for this sample should be considered with reasonable confidence.

When the study sample was split and analyzed according to educational program, the 126 medical students at the beginning of the fall 2005 semester were considered adequate for all statistical analyses. On the other hand, the number of eligible data from PA students fell below 30 (repeat students or students who did not sign their consent forms excluded). The sample size of this group of students created limitations to conclusions that could be drawn using the statistical results, since too small of a sample size is more likely to result in a Type I statistical error. However, the number represented all the PA students who enrolled in the University of North Texas Health Science Center's PA program that year and were eligible for analysis.

While the 63 subjects who participated in the follow-up survey at the end of the semester represented only 41% of the original student sample, it could be considered a representative sample of the eligible DO and PA students. In general, that sample size was sufficient for examining differences between the means through ANOVA; however, the cases-to-independent variables ratio was too small to draw solid conclusions with the multiple linear regression procedures. Caution must be used when drawing conclusions regarding the end of semester survey results. The same problems of analysis applied to the sample sizes of the health professions students when divided and analyzed by educational program ( $n = 42$  and  $n = 21$ , respectively). Yet the data analyses of this study, even with the small sample sizes, could be considered preliminary findings and used as a foundation for guiding future, more robust, study

designs on the subject of learning motivation and student outcomes in the health professions.

### Study Instrument

Goal orientations have been linked to specific learning strategies in the literature. Mastery goals have been linked with metacognitive learning strategies and performance goals have been linked to non-cognitive learning strategies (Archer, 1994; Lindemann et al., 2001; Perrot et al., 2001; Sorbal, 2004). While the Archer survey and the Modified Archers Health Professions Motivation Survey attempted to measure goal orientations and strategies as independent variables affecting learning, this study was unable to verify the independence of those two constructs by factor analysis of the MAHPMS items in this sample. Learning strategy items were reclassified into their associated goal orientation items as indicated by the statistical analysis of the instrument. Future studies may better be served utilizing instruments that focus on goal orientations, such as the Comprehensive Goal Orientation Inventory used by Gardner (2006) or instruments that measure combinations of goal orientations and learning strategies, such as the Approaches to Learning Inventory used by Lindemann et al. (2001) or the Motivated Strategies for Learning Questionnaire used by Garcia and Pintrich (1992).

### Learning Motivation Preferences

The high prevalence of student preferences for the mastery goal orientation to learning, seen by both the medical students and the physician assistant (PA) students at the University of North Texas Health Science Center (UNTHSC), was stable and

persisted throughout the fall 2005 semester. This finding agreed with the Perrot et al. (2001) study for the first year medical and nursing students at the University of Arkansas for Medical Sciences in 1998 -1999. In that study, the majority of medical students and nursing student exhibited a preference for the mastery goal orientation as well. Pharmacy students were more evenly split between mastery goal orientation and performance goal orientation. (Perrot et al., 2001).

No medical student or PA student in this study showed a preference for the alienation to learning goal orientation either at the beginning of the semester or at the end of the semester. Preferences for learning mastery and the absence of students who exhibited learning alienation should be expected at this level of graduate education. Selection criteria for admission to these health professions programs require high levels of achievement and academic success at the undergraduate level. Students with alienation to learning preferences at the undergraduate level would not be expected to perform at a level that would qualify them for these professions.

Medical students and PA students at UNTHSC also demonstrated internal locus of control preferences at high frequencies. The prevalence for an internal locus of control decreased slightly for the medical students and increased slightly for the PA students at the end of the semester. Whether the differences in locus of control preferences were due to the students' response to the professional curricula, or whether the results were biased because of the small percentage of medical students who participated in the follow-up survey, could not be determined. While over three-fourths of the PA students who started the study also finished the study, only one-third of the medical students completed the study. The change in the locus of control (LOC) for the

medical students may just have been attributed to a self-selection bias based upon the individual characteristics of the students who chose to participate in the end of semester survey. On the other hand, the low response rate by the medical students at the end of the semester did not appear to affect the goal orientation preferences.

In general the mastery goal orientation to learning (GOM) and the internal locus of control (LCI) combination has been considered beneficial to higher education outcomes (Archer, 1994; Perrot et al., 2001; Gardner, 2006), particularly in the health professions, since these graduates are expected to be self-regulated, life-long learners and strive to understand medical concepts with enough breadth and depth to be competent practitioners. Since an external locus of control (LCE) and alienation to learning (GOA) have been linked (Seifert & O'Keefe, 2001), students who displayed these two learning motivation preferences would not be expected to reach and maintain the expected level of diligence in problem solving required by health professionals (Gardner, 2006). Performance goal orientation (GOP) may still produce health professions students who obtain a high level of academic achievement (high grades) in their programs, especially when combined with an internal locus of control preference (Simons et al., 2004), but does not necessarily translate into clinical competence in the practice setting (Friedman et al., 1998). While only about one-quarter of the students in this study reported a performance goal orientation preferences (higher GOP mean scores than GOM or GOA), mean GOP scores did relate to academic outcomes in specific courses that semester.

## Research Question 1: Relationship between Learning Motivation Scores and Cumulative Semester Grades

The mean scores on all five learning motivation scales used in this study were analyzed to determine the ability to predict end of semester academic outcomes based upon these scores. The actual mean scores for the five motivation scales were used and not learning preferences per say; i.e., the goal orientation or locus of control category with the highest mean score. Since individuals tend to be motivated to some degree by all three goal orientations, but have only one that could be considered preferential, it was considered more beneficial by the author to explore actual mean scores in the categories of learning motivation to determine the relationship of these scores, alone or in combination, with academic outcomes.

The learning motivation mean scores were analyzed both together as a group of covariables and separately as individual variables. The five learning motivations as a group did not statistically relate to cumulative semester grades for either the total group of students or the medical students at the beginning of the semester. Only the PA students' grades appeared to be affected by the group of five learning motivations self-reported by the subjects when entering their programs. When examined separately, alienation to learning (GOA) scores were predictive of cumulative grade averages for the total group of students. While the relationship is statistically significant, the relative ability of this variable to predict semester grades was small, accounting for less than 3% of the variance in the semester averages. While this number was small, it was considered a medium effect size by statisticians. (Kinnear and Gray, 2004). Practically speaking, this result was too small to be useful in determining the effect of the GOA motivation scores on academic outcomes for the 153 student subjects their first

semester. When separated by educational programs, only the physician assistant (PA) students showed a statistically significant relationship between GOA scores and semester averages. The effect size of GOA with this group of students was large, accounting for about 40% of the variance in that group's fall grades. The ability of alienation goals to predict medical school and PA school grades is counterintuitive; indicating that for some students, increases in end of semester grades might be expected with increases in their alienation to learning goals. Since the medical students did not show this pattern, when examined individually, perhaps the PA students' results unduly affected the statistical results of the total group. The small sample size of the PA students could have resulted in a Type I error, where the null hypothesis was rejected when, in fact, it was true for this GOA variable. The fall semester for the PA students included Basic Human Science, a 12 semester credit hour course. This course combined anatomy, physiology, and biochemistry and contributed to the majority of hours in the PA fall schedule. Basic sciences tend to require memorization and recall of scientific factual knowledge. As such, one might expect that performance goals, which seemed to be linked to non-cognitive learning strategies by factor analysis, would serve the students well in a course like Basic Human Science. However, GOP mean scores did not prove to be statistically significantly related to end of semester cumulative averages for the PA students based upon the beginning of the semester survey results. If a Type I error did occur with this sample, then it might be concluded that none of the individual mean scores involving learning motivations statistically related to fall semester grade averages for all the UNTHSC health professions students.

End of semester relationships between the predictor variables and semester averages made more sense when considering the theories behind the learning motivation constructs. Considered as a group, the mean scores for the five learning motivations accounted for about one-third of the variances in the cumulative semester averages for the 63 participants. When the learning motivations were examined individually, mastery goal orientation (GOM) scores alone were statistically correlated to cumulative grade averages, accounting for approximately 44% of the variance in the end of semester grades. When external locus of control (LCE) scores were added to the mastery learning scores, the predictive value increased and the two variables accounted for over 51% of the variance in the grades. Therefore, over half of the differences in the students' grades could be explained by mastery goal scores and external locus of control scores combined. While mastery learning and internal motivation have been considered desirable for health professions students, perhaps these students were more likely to be motivated by external factors, like recognition for grades, early in the educational process. Also keep in mind that most of these students reported an internal locus of control preference, but it was the actual mean score for external locus of control that statistically related to semester grades. Even though these students may have preferred internal motivation, it may have been the strength of external motivation that contributed to academic success that semester.

When the students were considered by educational program, some of the medical students' cumulative semester grade averages could feasibly be predicted based upon their mastery orientation to learning (GOM) scores alone. Mastery learning accounted for about 40% of the variance in the fall grades for the 42 medical student

subjects. On the other hand, performance goal orientation (GOP) scores emerged as a predictor variable for the PA students at the end of the fall semester, accounting for almost 55% of the variance in those students' grades. Performance goal orientation would be logical for the PA students, whose course work primarily consists of the basic sciences and physical exam skills that semester. While the end of the semester results were promising for linking academic outcomes to learning theories expressed in the literature, caution must be used because of the small sample size at the end of the semester. Larger studies would be needed to confirm or refute these relationships.

#### Research Question 1: Relationship between Learning Motivation Scores and Individual Course Grades

The learning motivation mean scores were analyzed both together as a group of covariables and separately as individual variables as they related to individual course grades. Four of the five medical school courses in fall 2005 consisted predominantly of basic science concepts, while osteopathic manipulative medicine was an osteopathic skills course. As a group of predictor variables, the five learning motivations as measured at the beginning of the semester did not statistically correlate to any of the fall semester course grades. In addition, no learning motivation score statistically correlated with course grades when tested individually for the 126 subjects entering medical school that fall. At the end of the semester, only the Endocrine 1 course grades were statistically related to the group of five learning motivation scores. The total group of learning motivations, measured in December 2005, accounted for approximately 31% of the variance in the Endocrine 1 grades for the medical students. Individually, mastery orientation to learning scores were only predictive for the Cell Science course grades



and the Nervous System 1 course grades, with large effect sizes according to Kinnear and Gray (2004), accounting for 12.5% and 20.3% of the variances, respectively. External locus of control scores were related to the Endocrine System 1 course grades, accounting for 17% of the variance for those grades. These three medical school courses focus on basic scientific concepts; however, the courses also include expectations that the students will be able to apply these concepts to medical cases and clinical problem solving when presented. Mastery learning, therefore, would be beneficial for the courses. The predictive ability of external locus of control for students in the Endocrine 1 course, again, might be due to the influence of external motivators on these young students entering professional programs for the first time immediately following college. And finally, performance goal orientation (GOP) scores positively correlated to the Osteopathic Manipulative Medicine 1 (OMM) course, accounting for 14.5 % of the variance in the course grades. The OMM course highly relies on psychomotor skills development which could explain the impact of the performance orientation variable on a percentage of this course's grades.

For the PA students, the five learning motivations as a group, measured upon entry to the program, statistically related to the Basic Human Science and the Epidemiology courses, accounting for 53% and 43% of the variances in the course grades, respectively. When the learning motivations were examined individually, all four fall courses showed statistically significant relationships to the alienation to learning goal orientation (GOA) scores measured at the beginning of the semester. The degree of relationships ranged from accounting for about 19% of the variance in the course grades for Introduction to the Master's Project to slightly less than 40% of variance in

the Basic Human Sciences grades. Again the PA student sample was small and statistical significance might be attributed to a Type I error in this sample. If this result is in fact the case, further analyses would be needed to determine what characteristics of the PA curriculum or the PA students contribute to these phenomena. Since these students have excelled academically in their undergraduate education prior to admission, are these courses designed to use learner characteristics that are contrary to the life-long learning attributes desired of graduate health care professionals? However, keep in mind that the majority of these students reported mastery goal and internal locus of control preferences, so the statistically positive relationship with alienation to learning was suspect.

On the other hand, learning motivation scores measured at the end of the fall 2005 semester showed a slightly different pattern for the PA students than at the beginning of the semester. Only the Basic Human Science grades statistically related to the total group of five learning motivations, where they, as a group, accounted for close to 50% of the variance in the course grades. Alienation to learning (GOA) continued to emerge individually as predictive of the Basic Human Science course grades and alone accounted for over 35% of the variance in that course. As might be expected, performance goal orientation (GOP) scores surfaced as predictive for the Physical Exam (PE) Skills course. That variable accounted for about one-fifth of the variance in the PE Skills grades. Like the Osteopathic Manipulative Medicine course in the medical school, PE Skills primarily relies on the development of psychomotor skills, and both of these courses are closely linked to professional identity in both careers. No other PA

course grades could be related with statistical significance with the end of semester learning motivation survey scores.

In summary, the medical students' grades in general appeared to be more highly affected by mastery and performance goals and external locus of control. The PA students' grades were more highly affected by alienation to learning or performance goals. For the most part, the effects of these relationships on course performance were medium to large, according to Kinnear and Gray (2004). Furthermore, the statistical relationships at the end of the semester changed to some degree from the beginning of the semester measurements. The question could be raised whether the self-perceived learning preferences reported by the students at the beginning of the semester were actual preferences, or perhaps what they expected they should have for these types of professional programs. Also, are the changes in the predictive value of the learning motivation scores at the end of the semester reflective of more accurate reporting of learning motivations or actual changes that occurred as a result of the educational treatment imposed by the respective curricula and assessment mechanisms? On the other hand, the changes could have been due to a self-selection bias imposed on the study based upon the particular subjects that participated at the end of the semester or a Type I error. Limitations of this study preclude answering these questions and would require further research to resolve.

#### Research Question 2: Differences in Learning Motivation Scores within the Study Sample

Research Question 2 investigated differences in the learning motivation scores within the student samples based upon the beginning of the semester scores and the

end of semester scores. In other words, were there significant differences in the two sets of scores for the 63 students who participated in both administrations of the survey instrument? In this study, there were no statistically significant differences in the scores for the total group of students. Likewise, there were no statistically significant differences in the learning motivation scores for the 42 medical students who completed both surveys. On the other hand, the physician assistant (PA) students did indicate statistically significant differences in their scores for the two administrations of the survey. However, the small sample size of the PA students increased the possibility of rejecting the null hypothesis when it was true.

If, in fact, learning motivation scores were stable within groups of subjects, then it was more likely that differences in the predictive value of the scores might be due to the educational interventions of the programs and the approach of students to those interventions. Two studies have indicated that: 1) changes in learning strategies occurred in response to a dental school curriculum (Lindemann et al., 2001) and 2) mastery goals could be improved in nursing students with planned educational interventions (Gardner, 2006). Larger studies with longitudinal follow-up over the course of entire curricula would be useful in drawing those types of conclusions.

### Research Question 3: Differences in Learning Motivation Scores by Demographic Categories

Research Question 3 looked at differences in learning motivation scores when students were divided into demographic categories and by educational program. At the beginning of the semester, there were no statistically significant differences between the five learning motivation scores of the students in the two educational programs,

indicating that both groups of students were similar in their approach to learning. Unfortunately a key learning motivation, mastery goal orientation (GOM), could not be considered for that administration of the survey instrument, since homogeneity of variance was not assumed for the variable. For the 63 respondents who filled out the end of semester MAHPMS survey, the 42 medical students scored statistically significantly higher on the alienation to learning (GOA) scores and on the external locus of control (LCE) scores than the 21 PA students. Again this difference might be due to the sample bias represented by self-selection of those who chose to participate in the second survey.

When examined by gender, females exhibited higher mastery goals (GOM) than their male counterparts both at the beginning and the end of the fall 2005 semester. In addition, internal locus of control (LCI) scores for male students were statistically significantly lower than their female peers at the beginning of the semester. The differences in mastery goals by gender persisted at the end of the semester; however, differences in LCI scores did not persist for the end of semester surveys. Differences in mastery goals, based upon gender, were understandable in light of the fact that the majority of students in both professional programs were female. This phenomenon would contribute to the finding that the majority of students in both programs reported a preference for the mastery goal orientation to learning.

Age, when divided between those students younger than 25 years and those 25 years old or older, revealed statistically significant differences between four of the five learning motivation scores. Older students exhibited higher levels of mastery goal orientation (GOM), while younger students were more apt to have higher performance

(GOP) or alienation to learning (GOA) scores and more likely to have an external locus of control (LCE). The same age differences persisted for the GOP and the GOA scores at the end of the semester as well. For this study, both programs contained a high number of students younger than age 25. On average, medical students were slightly younger than PA students (mean ages: 25 and 26, respectively). Given the respective class sizes, the medical school consisted of a large number of students under 25 ( $n = 71$ ; 56%). However a large percentage of PA students were also younger than 25 ( $n = 14$ ; 52%). While the large number of students under age 25 in both programs might score lower than the older student on the mastery goal scores, the majority of students in both programs still scored higher on mastery (GOM) than the other two goal orientations (GOP and GOA), based upon learning preference frequencies.

Only one learning motivation mean score appeared as statistically significantly different, based upon the marital status of the students. Single students exhibited higher external locus of control (LCE) scores than did their married peers, at least at the beginning of the semester. No learning motivation indicator emerged as different based upon marital status at the end of the semester. Again, the mastery orientation to learning (GOM) could not be analyzed at the beginning of the semester because homogeneity of variance could not be assumed for that variable. Single students comprised the majority of students in both educational programs (76% and 63%, respectively), and while they may score lower than married students on internal locus of control (LCI), the majority of students in both programs still scored higher on LCI than on LCE as evidenced in the learning preference frequencies.

Learning motivation preferences were also examined based upon three ethnicity classifications. Due to highly unequal sample sizes, ethnicity was categorized into Caucasian, Asian/Pacific Islander, and minority (Hispanic, African American, and Native American) categories. There were no differences in learning motivation scores between ethnic categories when measured at the beginning of the fall semester in 2005. End of semester motivation scores revealed that Asian/Pacific Islander students exhibited statistically significantly higher means for alienation to learning than their Caucasian counterparts. No other differences were found based upon ethnicity. As stated earlier, the changes in the learning motivation differences from the beginning to the end of semester could either be due to students' responses to their educational programs' or due to a self-selection sample bias for end of semester study participants. Even with the relatively small number of minority students in both samples, it was encouraging that no statistically significant differences in learning motivation scores existed for that group of students, as programs explore strategies to increase much needed diversity in health professions programs.

Finally, analyses were performed to see if there were statistically significant differences in the learning motivations scores for students whether they had children in the home, whether they were admitted on their first application to the professional program, and whether the students' undergraduate majors were in the biological sciences. No statistically significant differences in learning motivation scores surfaced for any of these demographic categories either at the beginning or at the end of the fall semester in 2005.

In summary, it might be interesting to predict the types of learning motivations affecting medical students and physician assistant students based upon the demographic characteristics of the majority of students in both programs. Based upon the frequency distributions of gender, age and marital status, both groups of students would be expected to be affected by all three goal orientation perspectives, since the majority of students in the study sample were single, female students under the age of 25. The female majority in both programs would exhibit higher levels of mastery goals than males, while the younger students would exhibit higher levels of performance goals or learning avoidance than older students. Since the majority of the students in both educational programs were single, student learning at the beginning of the curricula might be affected more by an external factors. What was not known was whether gender or age tendencies would be stronger in regard to learning motivations. If students were typically female and under 25, which learning motivations would dominate?

#### Research Question 4: Predictive Ability of Learning Motivation Scores

While mastery learning and internality have been associated to deeper understanding, tenacity in problem solving, and academic success (Garcia and Pintrich, 1992; Linder and Janus, 1997, Gardner, 2006), examining whether learning motivation scores actually predict student membership into academic risk categories would be helpful in assessing the practical predictive ability of these types of measurements. No learning motivation scores were able to predict academically high risk students for the total group of students or the medical students, when measured at the beginning of the



semester. However, alienation to learning (GOA) scores predicted academically high risk students in the PA program almost 90% of the time. It would be logical to assume that higher GOA scores would predict academically high risk students in these professional programs. Yet it was unclear to me how to interpret the finding that GOA scores positively correlated to end of semester cumulative averages and the Basic Human Science (BHS) course grades for the PA students as well. Of course caution must be exhibited when drawing conclusions from this small sample of students.

End of semester learning motivation scores revealed an external locus of control (LCE) as predictive of academically high risk students in the total group ( $N = 63$ ) of participants 81% of the time. Yet, no learning motivation score was predictive of high risk students when subjects were divided into their respective educational programs. Unfortunately, for all these statistically significant predictors, the small sample sizes (low cases-to-independent variables ratios) produced limited ability to draw solid conclusions based on the data. However, the results of this study agreed with the literature that alienation to learning and externality may be linked and negatively correlated to mastery learning and academic success described by Siefert and O'Keefe (2001).

### Limitations and Biases of the Study

There were several limitations and biases inherent in this research study that would require caution when drawing conclusions from the study results. First of all, the sample of students included in this study was representative of just one type of medical school and one physician assistant (PA) program in one state in one region of the country. It was a convenience sample, and as such, study results could not be

generalized to the entire population of medical or PA students in Texas or in the United States. The results of this study must only be applied to this particular group of medical and physician assistant students enrolled in one osteopathic medical school in north Texas. The PA student sample was small and the sample of students who elected to participate in the second administration of the MAHPMS survey at the end of the semester was also small, leaving questions as to whether the statistical analyses conducted on those samples would be helpful. Yet these student samples could be considered a representative sample, whose results might be used to develop larger, longitudinal studies for more meaningful results.

Students who withdrew from their educational programs before the end of the semester were not available for the follow-up survey. While their learning motivation preferences measured at the beginning of the study were analyzed for all outcome variables, their end of semester grades could only be based upon the courses that were completed prior to withdrawing from school. Their data, therefore, may have biased the results of the study. On the other hand, the number of student withdrawals prior to the end of the semester was very small ( $n = 3$ ). Since most withdrawals are due to course failures, those students were still included in the “high risk” academic category analyzed in Research Question 4.

The instrument itself was relatively new and untested in large numbers of health professions student populations. Therefore, it is unknown whether the survey items accurately measure the intended learning motivation constructs. In fact, in this study, survey items intended to assess learning strategies by the original authors were not statistically shown to be independent measurements from goal orientations by factor

analyses. Since learning motivations consist of complex psychological constructs, the self-reported approaches to learning measured by this instrument may not accurately assess the actual attributes in health professions students. In addition, Hendren (1988) concluded that medical students who had the lowest graduation rates were students who had problems with interpersonal relationships. Personal and psychological traits that contribute to interpersonal difficulties may be related but different from those attributes that contribute to learning motivation.

The study design itself produced limitations and biases in this study. The adequate response rate of the targeted student sample at the beginning of the semester was largely due to face-to-face recruitment and immediate data collection procedures. The planned procedures for collecting follow-up survey data at the end of the semester were flawed. Letter and email requests for information typically can result in low response rates from participants. (Gall, Gall, & Borg, 2003). Perhaps a face-to-face request and survey collection at the end of the semester would have produced a better response rate.

Using end of semester grades as the targeted academic outcome measurements ignored important educational outcomes related to competent practice. Grades have been shown to have a limited relationship with clinical competence (Rippey, Thal, and Bougard, 1981) and might not be an appropriate outcome value for the mastery approach to learning. For those students, grades are not as important as thoroughly understanding the material. (Ames, 1992; Archer, 1994; Blumenfeld, 1992; Perrot et al., 2001). Other types of measurements should be identified to thoroughly examine how motivational constructs affect the desired outcomes related to clinical competence.

Future studies might be better accomplished with studies similar to the one done by Garcia and Pintrich (1992) with college students, utilizing the Motivated Strategies for Learning Questionnaire (MSLQ), which measures multiple approaches to learning and critical thinking. In addition, research would be needed to investigate the effect of learning motivation on clinical assessments used in supervised practice settings, such as clinical rotations or residency programs.

And finally, the length of the study posed some limitations. To understand how learning motivation affects students in health professions programs, multiple learning outcomes must be studied throughout the educational curricula. The measurement of academic achievement after one semester does not adequately analyze the predictive value of these constructs in graduate-level professional programs that are three, four, or more years in length. In medical education, residency training beyond undergraduate medical education may also need to be addressed in causal relationship studies relating to learning motivation and clinical outcomes.

### Practical Significance

In general, this study indicated that higher alienation to learning goals and an external locus of control were predictive of academic at risk categories after the first semester of medical or PA school. At the same time as a result of the study's limitations, it is recommended that analyses from this investigation be used to design larger, longitudinal studies to more completely understand the effect of approaches to learning on competency outcomes for students in the health professions. For example, are learning motivation preferences stable over time or do preferences change as a

result of the educational experience, as suggested by Lindemann, Duek, and Wilderson (2001)? If learning motivations can change, then their usefulness in selection decisions for admission to health professions programs is limited. If desirable learning goals can be taught as indicated by Gardner (2006), academic support offices might use the information to develop successful programs for improving learning approaches by students, given the high investment needed for this type of education.

Merely improving a medical student's knowledge base alone does not necessarily translate into fewer diagnostic errors (Friedman et al., 1998). Therefore, another question that needs to be addressed involves what approaches to learning are most successful in developing the critical thinking skills needed in the health professions? If health professions curricula are shown to require higher performance or alienation to learning goals to be successful, are these programs designed to produce graduates with learning characteristics contrary to the stated desires of these professions (critical thinkers and self-motivated, life-long learners)? To perform such studies, valid mechanisms would be needed to assess critical thinking as an outcome variable instead of academic grades.

The question of which student characteristics result in desired graduate outcomes, based upon an acceptable level of competence, has long been pursued in health professions education. While the answer to this question is complex and has been elusive, continued research efforts are needed to assist educational programs in designing curricula, assessing competencies, and guiding students toward that end, in order to serve the public with the best quality of health care possible.

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